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REMARKS ON THE PREPARATION OF LIQUOR BISMUTHI.

By Albert E. Ebert.

This subject was introduced by Mr. C. R. C. Tichborne, (Lond. Pharm. Journ., Jan. 1864,) and was thorougly investigated some months later by Mr. N. Gray Bartlett, who communicated the results of his examination to this Journal (Jan., 1865.) Since the appearance of the latter paper an article was published by Mr. Thos. P. Blunt, (Lond. Pharm. Journ., May, 1865) in which Mr. Bartlett's process was declared unsatisfactory, though at the same time a formula was submitted which, in all essential points, was but a reproduction of that of Mr. Bartlett. Subsequently, a rejoinder, by Mr. Tichborne, appeared, (Lond, Pharm. Journ., June, 1865) reiterating his former statements, which had been disputed, and suggesting another method of preparing liquor bismuthi. This consisted in dissolving crystallized ter-nitrate of bismuth in water, adding a due proportion of citric acid, and neutrallizing the liquid with ammonia. These papers, instead of further elucidating the subject, have left it in such a state of uncertainty, that many may be deterred from attempting the preparation of liquor bismuthi.

The large demand which has followed the introduction of this solution, and the evidences of favor with which it has been received, convince me that it is of too much value to be allowed to fall into discredit through fallacious formulas or the disputes of inventors.

After a series of carefully conducted experiments with the different processes, I have arrived at the following conclusions:

First. Teroxide of bismuth, though recently precipitated,

but sparingly soluble in citrate of ammonia, even at the boiling temperature. The presence of a portion of nitrate of ammonia, through insufficient washing of the teroxide, will effect a solution.

Secondly. A neutral solution of citrate of bismuth, obtained by means of citrate of ammonia and ammonia, or by ammonia alone, of such strength that a fluid drachm contains one grain of teroxide of bismuth, is prone to decomposition. This change is not attended by the deposition of a basic salt, but by the formation of humus: the liquid acquiring, meanwhile, a disagreeable smell and taste, which totally unfit it for use.

This is prevented by the addition of alcohol, whereby it is preserved indefinitely. A concentrated solution appears to keep well without this addition of spirit.

Thirdly. Mr. Blunt's assertion that, by Mr. Bartlett's process, a large loss of citrate of bismuth is incurred, is erroneous, and must have arisen from the employment of nitric acid, sp. gr. 1·5, (Ph. Br.) instead of that of the sp. gr. 1·42, (U. S. Ph.) Another inaccuracy occurs in the direction, to "add solution of potassa until the mixture is only faintly acid;" before this point of saturation is reached, the precipitate, first formed, will be entirely redissolved, When only sufficient potassa is added to neutralize the nitric acid, the citrate of bismuth is precipitated; an excess of the alkali over this quantity *dissolves* the citrate of bismuth, the solution still having an *acid* reaction. Even when the potassa is employed in atomic proportions the yield of citrate of bismuth is *no larger* than is obtained by precipitation with citrate of potassa. The process recently suggested by Mr. Tichborne (before alluded to) I consider highly objectionable, because of the presence of nitrate of ammonia. A little more than one grain of the latter salt being administered with every grain of teroxide of bismuth: such an addition could scarcely fail to interfere injuriously with the therepeutical action of the bismuth. Though I have employed Mr. Bartlett's process many times, and with uniform success, I prefer a modification of it, embodying the idea of Mr. Blunt, i. e., in dissolving the citric acid in the solution of nitrate of bismuth, and adding a sufficient quantity of potassa to exactly saturate the nitric acid employed. The ad-

vantage being that the citrate of bismuth thereby produced is more readily washed, and is more rapidly and completely dissolved by ammonia.

The process is as follows:

Take of Subcarbonate of bismuth a troyounce;
Citric acid (in powder) 420 grains;
Nitric acid, sp. gr. 1·42, a troyounce and a half;
Pure caustic potassa 450 grains;
Distilled water,
Alcohol, each, a sufficient quantity.

Dissolve, by gradual addition, the subcarbonate of bismuth in the nitric acid, and, when effervescence has ceased, dilute the solution with a fluidounce and a half of distilled water; now add the citric acid, and stir until it is dissolved. In eight fluidounces of distilled water dissolve the caustic potassa, and add this gradually to the acid solution. Permit the mixture to stand for six or eight hours, then transfer to a moistened paper filter, and wash the precipitate until the washings no longer contain nitrate of potassa. Transfer the still moist magma to a dish, and add, very gradually, water of ammonia until the precipitate is dissolved, and a neutral solution is obtained. Dilute this solution with an equal volume of distilled water, and treat half a fluidounce of the liquid with hydrosulphate of ammonia, in slight excess; wash the precipitate on a tarred filter, dry on a water bath and weigh. Multiply the weight of the sulphide of bismuth by the fraction ·908, to determine its equivalent in teroxide of bismuth. Apply the same ratio to the remainder of the liquid, and dilute it to such an extent that a fluid drachm shall contain one grain of teroxide of bismuth, seven-eighths of which measure must be made up with distilled water, and the remainder with alcohol. The average product of liquor bismuthi, from a troyounce of subcarbonate of bismuth, was 50 fluidounces, indicating a loss of bismuth amounting to 7·6 per cent.

This loss is occasioned by the slight solubility of citrate of bismuth in the washings, and though this portion may be recovered, it is too small in amount to compensate for the time and trouble necessarily expended in its separation.

Chicago, December, 1865.

ON THE ACTIVE PRINCIPLE OF RHUS TOXICODENDRON.

By John M. Maisch.

Notwithstanding the poisonous qualities of Rhus Toxicodendron have been known for a long time, it was not until the year 1857 that an analysis of its constituents were made by Dr. Joseph Khittel, which was published in Wittstein's Vierteljahresschrift, vii. 348–359. A condensed translation of this paper appeared in the American Journal of Pharmacy, 1858, p. 542–544. According to this author, the activity of the leaves of the poison oak depend on a volatile alkaloid, which he obtained by distilling the concentrated infusion of the powdered leaves with caustic potassa, neutralizing the distillate with sulphuric acid, evaporating the liquid, and treating the residue with a mixture of equal quantities of ether and alcohol, whereby sulphate of ammonia was left behind; the ethereo-alcoholic solution was evaporated spontaneously, distilled with caustic potassa, and an alkaline liquid obtained, which could be neutralized with hydrochloric acid, and then yielded a precipitate with chloride of platinum.

Since that time, I have not met with another investigation.

I may as well state at the outset, that my results are entirely at variance with those of Dr. Khittel; and it may, therefore, not be out of place to criticise the above process now.

It is well known that the *exhalations* of Rhus Toxicodendron exert a poisonous influence on the human body; the poisonous principle must, therefore, be volatile, and, at the same time, be naturally in such a loose state of combination as to be continually eliminated and separated with the usual products of vegetable exhalations. It is natural to suppose that, during the process of drying, the greatest portion of the poisonous principle should be lost. This loss must be still greater, if the dried leaves are powdered, a hot infusion prepared from them, and this infusion evaporated down to the original weight of the dried leaves. It is obvious that Dr. Khittel could not have selected a better method for obtaining the least possible quantity of the poisonous principle, if, indeed, it could be obtained by this process at all.

The Association being desirous to know by what method the activity of these leaves can best be preserved, I accepted the question, and commenced my experiments in 1864, basing them upon the results obtained by the author before mentioned. I may state here, that I have frequently collected the leaves, flowers, and fruit of Rhus Toxicodendron, and its variety, radicans, without ever experiencing any ill effects. I have handled all parts of the plant with perfect impunity, and have even spread the juice over my hands, without feeling more than a slight itching upon the upper side of the hand, which immediately disappeared on washing the hands with water. In a word, I considered myself so little subject to its influence, that I collected the leaves for all the following experiments myself; and on one occasion, on the hills of the Wissahickon, laid down in the midst of a beautiful specimen of Rhus Toxicodendron var. radicans, which spread so prolifically over shrubs and trees, and through the grass beneath, that I was on all sides surrounded by its branches, leaves, and flowers; although remaining in this position for over fifteen minutes, selecting the most vigorous leaves, I escaped with no other effects than those described before, which yielded at once to ablutions with the water of this little stream.

I could hardly expect to try the efficacy of the poisonous principle, when isolated, upon my own person; the result, however, proved to be very different.

But to return to the experiments: I immersed 8¾ ounces of the leaves of the true Rhus Toxicodendron in alcohol in sufficient quantity to cover it, and added enough sulphuric acid to produce a strong acid reaction, in order to combine all the alkaloid. The vessel was set aside for about nine months, the alcohol then spontaneously evaporated, the residue forcibly expressed, mixed with a little water, and again expressed, and the united liquids distilled with an excess of lime. I selected this base, because from its sparing solubility, it might be expected to act less energetically in inducing decomposition than potassa. The alkaline distillate, when collected by itself, reminded forcibly of the odor generated by decoctions of hemlock and henbane. The alkali was collected in an excess of

dilute hydrochloric acid, and this solution had the same odor. It appeared most likely, from this experiment, that the odor was entirely distinct from the alkaline reaction, or, in other words, that the odorous compound and the alkali were two different bodies.

The solution had still an acid reaction from the excess of hydrochloric acid employed when the distillation was stopped. The liquid was now evaporated to dryness, in a current of dry air at a temperature of about 120° F., and yielded a considerable amount of a crystalline residue, to which the same odor still adhered to a certain degree. This crystalline mass now must contain the volatile alkaloid of Dr. Khittel.

A portion of it was dissolved in distilled water; the reaction of the solution was neutral to litmus paper. Tested with Sonnenschein's phospho-molybdic acid, a light-yellow precipitate was obtained, which yielded with potassa the odor of ammonia only; with Mayer's iodo-hydrargyrate of potassium in acidulated solution, no precipitate was produced; on adding potassa, an orange-brown precipitate occurred; tannic acid yielded no precipitate; neither did iodine; all the reactions proved the presence of ammonia only. A portion of the crystalline mass was now taken up by dilute sulphuric acid, again evaporated to near dryness, the residue almost neutralized by potassa, mixed with three times its bulk of 95 per cent. alcohol, and the same quantity of ether, and, after standing over night, filtered. The ethereal liquid was evaporated spontaneously, and left a minute residue, which, on being treated with potassa and heated, gave not the slightest evidence of an alkaline reaction; but phospho-molybdic acid appeared to create a very faint turbidity.

It was possible now, that, by the long maceration of the leaves with sulphuric acid and alcohol, the alkaloid was decomposed. To ascertain this, twelve ounces of fresh leaves were collected, infused in cold water, expressed, and, after a second maceration, again expressed. The liquid was again distilled with caustic lime, and the distillate collected in dilute sulphuric acid. After spontaneous evaporation in a current of warm air, as before, the residue was carefully neutralized with

bicarbonate of potassa, and treated with alcohol and ether with precisely the same results as stated above; it is not impossible that large quantities of a mixture of alcohol and ether will dissolve minute traces of sulphate of ammonia.

It was evident now that our Rhus Toxicodendron does not contain any volatile alkaloid.

Another lot of vigorous leaves was now collected, enclosed in a tin box, and a number of moistened test papers introduced. The next morning, it was observed that the curcuma and red litmus papers were unaffected, but that the blue litmus papers had been colored strongly red. This single experiment was at once a conclusive proof that the exhalations of these leaves contained a volatile acid, and that the poisonous properties were most likely due to it.

These leaves were now bruised with six per cent. of their weight of slaked lime, and, after maceration with a sufficient quantity of water, expressed, again macerated and expressed, and the liquor reserved for a few days for further investigation.

In the meantime, the residue in the retort from the previous lot was mixed with sufficient sulphuric acid to impart a strongly acid reaction, and then subjected to distillation, the distillate being collected in water containing carbonate of baryta in suspension. *This distillate had nearly the same odor as the distillate obtained by lime*, and the conclusion arrived at before, that the odorous compound was a distinct body, was thereby verified. The distillation was soon stopped, because this product was merely intended for experiments, and to ascertain whether the previous continued heating with lime, had produced a change in the acid or not. During this process, a slight eruption appeared above the wrists on both my arms, but was ascribed to the extremely hot weather. It was treated with subacetate of lead, and no further notice taken of it.

The solution of the baryta salt, thus obtained, was tested with various reagents: nitrate of silver produced a slight milkiness, removable by nitric acid; on standing, a copious black precipitate was obtained; bichloride of mercury, after some time, produced a white precipitate, then supposed to be calomel; bichloride of platinum an extremely slight deposit;

chloride of gold, after boiling, a separation of metallic gold adhering to the test tube; acetate of lead, a white precipitate, soluble in nitric acid; neutral tersulphate of iron, (I had then no neutral sesquichloride of iron on hand,) a precipitate of sulphate of baryta, and apparently a slight red coloration.

These reactions appeared to be so nearly identical with those of formic acid, that I was almost satisfied that the dreaded poison of the Rhus Toxicodendron was the same compound which is generated by the little busy Formica rufa.

The expressed liquid, set aside as before stated, was now subjected to distillation, after having been previously mixed with an excess of sulphuric acid. A portion of the distillate was again collected in water, holding carbonate of baryta in suspension; another quantity was condensed by itself, to obtain the pure acid. This acid had a similar odor, as noticed before, but it changed and disappeared almost entirely on rectifying the liquid over chloride of calcium.

The acid solution, as thus obtained, is colorless, strongly affects blue litmus paper, and neutralizes bases; but the salts with the stronger bases show a distinct alkaline reaction. Added to solution of *acetate* or *subacetate of lead*, the acid produces a heavy white precipitate, which is scarcely soluble in boiling water, but readily soluble in nitric acid; with *corrosive sublimate* and *bichloride of platinum* no alteration takes place even after boiling; *chloride of gold* is in the cold slowly, at the boiling heat rapidly, reduced, and a film of metallic gold deposited; with *nitrate of silver*, no immediate alteration occurred in the cold, but gradually a black precipitate of oxide of silver takes place, which is produced in a few minutes, if the mixture is boiled. This separation of the oxide of silver must be caused by the mutual decomposition of the acids, whereby the oxide is liberated; for, if the acid is boiled with pure oxide of silver, and the solution filtered while hot, it retains the silver in solution. A salt of the new acid produces, in nitrate of silver, a white turbidity, changing to a black precipitate, on standing, or, in a few minutes, on boiling; but entirely removable by the addition of nitric acid.

Protonitrate of mercury is not affected by the pure acid,

either in the cold or on boiling; but treated with the solution of a salt of the new acid, a white precipitate is produced, which gradually, but, on boiling, instantly changes black; nitric acid dissolves it readily.

Red oxide of mercury is dissolved by the boiling acid; the solution, filtered while hot, deposits, on cooling, nearly all the salt, leaving, however, enough in solution to affect hydrosulphuric acid considerably. This white mercuric salt is the same as the white precipitate occurring in solutions of a salt of the new acid with bichloride of mercury, and it is not reduced either on standing or by boiling.

Protoxide of lead is readily taken up by the boiling acid, forming a solution of a strong alkaline reaction, which, on cooling, precipitates most of the salt in white flocks, leaving the liquid decidedly alkaline; the salt is taken up by dilute nitric acid.

Carbonate of copper dissolves in the boiling acid to a bluish green solution, which forms no precipitate on cooling.

Neutral sesquichloride of iron is not affected in color, either by the pure acid, or by one of its salts.

Permanganate of potassa is readily reduced.

Chromate of potassa is not reduced to chromic oxide, on boiling, either with the free acid or one of its salts.

Comparing all these reactions with those of formic acid, it will be seen that only the behaviour to chloride of gold, and the reduction of metallic gold from the solution are identical; in the sparing solubility of the lead salt, the two acids likewise resemble each other. This acid has more reactions in common with acetic acid, among the most prominent of which are the slight alkaline reaction of their salts with alkalies and alkaline earths, and the strong alkaline reaction of the (basic?) lead salt.

But the behaviour of this acid and its salts to oxide of silver, nitrate of silver, oxide of mercury, and corrosive sublimate, distinguish it readily from both formic and acetic acid.

Taking all the reactions together, it is, unquestionably, a new organic acid, for which I propose the name of *Toxicodendric acid.*

That it is the principle to which the poison oak owes its effects on the human system, was proved to my entire satisfaction by the copious eruption and the formation of numerous vesicles on the back of my hand, on the fingers, wrists, and bare arms, while I was distilling and operating with it. Several persons, coming into the room while I was engaged with it, were more or less poisoned by the vapors diffused in the room; and I even transferred the poisonous effects to some other persons, merely by shaking hands with them.

The dilute acid, as obtained by me, and stronger solutions of its salts, were applied to several persons, and eruptions were produced in several instances, probably by the former, though not always, which was most likely owing to the dilute state of the acid. Whenever this was boiled, I always felt the same itching sensation in the face, and on the bare arms, which I experience on continual exposure of my hands to the juice of the plant.

As remedies against it, I have tried subacetate of lead, permanganate of potassa and ammonia, the last, I believe, with the best success. Alkaline solutions were first recommended by Prof. Procter, I believe, and, as my experiments show, they are the remedies which, *à priori*, might be expected to afford the greatest relief, just as in the case of formic acid. The eruption produced by this acid is very similar in its nature to the one produced by toxicodendric acid, and its effects yield readily to alkaline lotions. It is not unlikely that, like the formiates, the toxicodendrates are without any ill effects, if applied externally. The reactions of our new acid show, likewise, the reason why permanganate of potassa, subacetate and even acetate of lead may be valuable remedies for this eruption. While the former completely decomposes it, the last named salts produce nearly insoluble precipitates with it; at least, toxicodendric appears to be stronger in its affinities than acetic acid.

The question may now be asked, how Dr. Khittel, in his otherwise carefully performed analysis, could overlook such an important constituent? The answer is partly given in the remarks previously made; the drying and powdering of the

leaves must expel a great portion of the volatile poison; but in the course of his analysis, he has removed it from the ethereal liquid by distillation and evaporation with water, and if any should have been left in the then resulting aqueous solution, it was precipitated by sugar of lead, and may have been regarded as phosphoric acid, or may have been mixed with the peculiar tannate of lead.

Not having the original paper at hand, I cannot positively speak on this point, or on the method employed which satisfied him at the start that the plant contained a volatile alkaloid. But I must reiterate that, by his method, I could not obtain it. The juice, however, contains notable quantities of ammonia salt, which are not only shown on the distillation with potassa or lime.

If the juice is expressed with the previous addition of a little water to the leaves, and then more acidulated with nitric acid, phospho-molybdic acid produces a yellow precipitate which was treated with soda, the distillate neutralized by sulphuric acid, and, after evaporation, treated with alcohol and ether; the residue from their evaporation was minute, and no alkaline reaction of the vapors, when treated with a fixed alkali, could be observed; but the acidulated solution yielded a faint turbidity with phospho-molybdic acid; none with iodohydrargyrate of potassium.

The expressed and acidulated juice gave no reaction with Mayer's test, except after rendering it alkaline by potassa, the behaviour of ammonia.

The residue in the retort, after the distillation of toxicodendric acid, behaved exactly like the juice. The excess of sulphuric acid was removed by neutralizing with bicarbonate of potassa, mixing with twice its bulk of strong alcohol, and distilling the alcohol from the filtrate, when it was tested with both Sonnenschein's and Mayer's reagents with the same results.

The question which I accepted is only partially answered; I have merely proved that the poisonous properties of Rhus Toxicodendron do not reside in a volatile alkaloid, but that they are due to a volatile acid. If I state that the dried leaves

do not contain a trace of the volatile alkaloid, it is only what might have been expected; but then it was not dissipated; it merely did not exist there previously.

But whether the toxicodendric acid is, to greater or less extent, lost in drying, I am as yet unable to say; though such a result may be expected. As regards its isolation, it is easily effected. The only questions are whether it could be procured in sufficiently large proportion to be remunerative, whether it is not altered by keeping in its pure state, and whether it possesses any intrinsic value in its medicinal properties. As far as our knowledge reaches, I belive the expressed juice, preserved by alcohol, to be the best pharmaceutical preparation.

Even in the chemical history of this acid, nearly everything is to be found out yet by further researches. If my time permits, I may attempt to prepare it in larger quantities, and in a more concentrated form, and to determine its composition.—*Proc. Amer. Pharm. Association*, 1865.

ON AN ANTIDOTE AT ONCE FOR PRUSSIC ACID, ANTIMONY, AND ARSENIC.

By T. and H. Smith, of Edinburgh.

[In 1854, Messrs. T. and H. Smith suggested the use of proto-persulphate of iron in connection with an excess of alkaline carbonate, as an antidote for prussic acid, based on experiments made on dogs. The difficulty has always been that the time required to prepare the antidote was too great, in view of the energy of the poison, and its rapid action. In this country it has for many years been the custom with some druggists to keep a solution of persulphate of iron ready for use with ammonia, for producing hydrated sesqui-oxide of iron.

In the "Pharmaceutical Journal" for October these gentlemen have a very long and elaborate paper on this subject, under the above title, in which they take advantage of the officinal (British) solution of perchloride of iron as the source of the hydrated sesqui-oxide, and appear to consider it superior to the solution of tersulphate usually employed as the source of sesqui-

oxide, and which is far more easily prepared and kept. This is also a preparation of the British Pharmacopœia.

The action of this antidote for prussic acid is based on its capability of instantly forming Prussian blue with that acid. When the antidote is used, the solution of carbonate of soda is first swallowed, and immediately afterwards the mixture of sesqui-chloride and protosulphate of iron, so that a mixture of sesqui- and protoxide of iron in a nascent gelatinous state is formed in the stomach, and this renders the poison inert, by forming Prussian blue. Owing to the fact that carbonic acid is eliminated in the use of the alkaline carbonate, and that this acid interferes with the action of the test, a large excess of the antidote is considered necessary by MM. Smith to insure its activity.

"When the poisoning has been caused by cyanide of potassium, in which the prussic acid is, as it were, united to a base, the alkaline solution forming one part of the antidote does not of course require to be given, although the antidotal action would not be prevented by giving it in the way recommended."

A considerable portion of the paper is taken up with discussing the preparation and action of hydrated sesqui-oxide of iron as an antidote to arsenious acid, embodying the facts that were examined twenty years ago in this country and in Germany, and which are noticed in the 14th and 25th volumes of this Journal, and which was noticed in the 2d volume of the "Pharmaceutical Journal." The numerous instances in which the hydrated oxide have been successfully employed in the United States have caused it to be much relied upon here, where the poison has not been too long ingested.

The Messrs. Smith have extended their experiments to tartar emetic, and find the sesqui-oxide to act equally well as an antidote; the sequel will show their results. It seems needless to recommend the solution of sesqui-chloride of iron for the purposes mentioned, when the tersulphate of sesqui-oxide of the Pharmacopœia is more easily prepared, cheaper, and contained in both the British and U. S. Pharmacopœias,—and especially as one part of Smith's antidote is protosulphate of iron, which of course gives a resulting sulphate of soda. Our experience with hydrated oxide is greatly in favor of ammonia, which is always ready, can

be added till in slight excess with certainty, as its odor detects an excess instantly, and Bunsen and others have shown that a slight excess of ammonia is advantageous. In order to render the following recipes for antidotes intelligible to the American pharmaceutist, we will state that one three-fourths drachms of our officinal solution of tersulphate of iron is equal to one drachm of the solution of perchloride of the British Pharmacopœia, used in the recipes. We also insert a supplement to the MM. Smiths' paper, from the "Pharmaceutical Journal" for November, modifying the prussic acid test.—Ed. Am. J. Ph.]

While engaged in these experiments on the antidotal action of hydrated oxide of iron on the poisonous effects of arsenic, the remarkable case of Dr. Pritchard had just occurred; and it at once occurred to us that there was a great likelihood, principally from the many chemical relations of antimony to arsenic, that the hydrated oxide of iron might also be an antidote to the poisonous action of antimony.

A few experiments soon confirmed, in the fullest manner, our anticipations. A mixture of solution of perchloride of iron, containing eighty grains of anhydrous peroxide of iron and a solution of one ounce avoirdupois of crystallized carbonate of soda, was prepared; to this mixture, containing hydrated peroxide of iron and chloride of sodium, was added a solution of ten grains of tartar emetic: the whole was thoroughly agitated, and thrown on a filter. The filtered liquid, acidulated with muriatic acid, was tested with sulphuretted hydrogen for antimony, but not a trace was found. The filter, with its contents, was then mixed with other ten grains of tartar emetic, which were again removed by the oxide of iron. A third quantity of tartar emetic added was almost entirely removed, so that eighty grains of hydrated peroxide of iron absorb nearly thirty grains of tartar emetic from solution.

The absorbing action of hydrated oxide of iron towards antimony would be still more striking but for the dissolving power of the tartaric acid, set free, upon the peroxide of iron. That the oxide of iron does not merely act by taking the organic acid and precipitating the oxide of antimony in an insoluble state, is

shown by using hydrate of magnesia instead. In this case, even with a much smaller quantity of tartar emetic, the filtered liquid gives antimony in abundance to the proper tests.

To be suitable for the antidotes, the liquor ferri perchloridi must answer to the following tests:—one fluid drachm must contain 15·62 grains peroxide of iron; ammonia must give a pure reddish-brown precipitate, without any shade of black; it must not smell strongly acid, nor, after slight dilution, give a brisk effervescence with a piece of zinc.

Directions proposed to be attached to each bottle of Liq. ferri Perchloridi:—

Prussic acid antidote.—Take of liquor of perchloride of iron thirty-seven minims, protosulphate of iron in crystals, as pure as possible, twenty-five grains; as much water as make a solution of a protosesquisalt of iron, measuring about half an ounce. Dissolve, on the other hand, seventy-seven grains crystallized carbonate of soda in about half an ounce of water. These quantities destroy the poisonous action of between 100 and 200 minims of medicinal prussic acid, officinal strength, on giving first the one liquid and then the other.

Antidote for cyanide of potassium.—The antidote for this compound is the same as for prussic acid, except that the solution of protosesquisalt of iron is to be used without the alkaline solution, the prussic acid being already combined with an alkali; the use of the alkali, however, would not be injurious; a harmless yellow prussiate would be formed. In this case, in consequence of the possible presence of free acid in the stomach, the alkaline liquid should be given first—the quantities given, as the prussic acid antidote would decompose thirty-five grains of cyanide of potassium.

Antidote for arsenious acid.—Measure out five fluid drachms and seven minims of liquor ferri perchloridi into two or three ounces of water, then add to the liquid a solution of one ounce of crystallized carbonate of soda in a few ounces of warm water, stir till effervescence ceases; the resulting mixture destroys about ten grains of arsenious acid.

Antidote for tartar emetic.—Mix five fluid drachms and seven minims of liquor ferri perchloridi with a few ounces of water;

mix in now a cream formed of ninety grains of calcined magnesia, rubbed up with water in a mortar, stir till, after gelatinizing, the mixture again gets thin; empty the mixture into a calico or muslin cloth, and press out the liquid; remove the mass from the cloth into a clean mortar, and rub it up with a little water into a smooth cream; in this state, it can destroy upwards of twenty grains of tartar emetic. It may also be used as an antidote for arsenious acid, of which it absorbs about ten grains.—*Lond. Pharm. Journ., Oct.* 1, 1865.

SUPPLEMENT TO PAPER ON AN ANTIDOTE AT ONCE FOR PRUSSIC ACID, ANTIMONY, AND ARSENIC.

By Messrs. T. and H. Smith.

In addition to and completion of our late remarks, in this Journal, on Sol. Ferri Perchloridi as an antidotal agent in poisoning by either prussic acid, antimony, or arsenic, it occurred to us, while our manuscript was in the compositors' hands, that the question may be asked—what effect would the not unlikely occurrence of free acid in the stomach have on the action of the prussic acid antidote when its use may be indicated? If the amount of acid could be known, the answer would be easy, viz.: the corresponding quantity of an alkali given in advance would prevent any interference with the desired action; but a quantity of alkali so great would be required to meet the most extreme case that the remedy might itself have an injurious action, or might form a soluble yellow prussiate which, although not poisonous, would be a less desirable product than the insoluble and inert Prussian blue. It therefore suggested itself to our minds that caustic magnesia might be a more desirable agent in such a case. A single trial showed that every difficulty is removed by the use of that substance, and that it does not interfere with the action of the antidote.

Ninety grains of calcined magnesia were made into a smooth cream with a little water; two drachms of muriatic acid were then added, and the acid was instantly neutralized, yet leaving a large excess of magnesia. 100 minims of medicinal prussic

acid were now added, and on now preparing to add the alkaline solution to form a cyanide, before the addition of the iron solution, it occurred to us that the excess of magnesia itself might form the cyanide necessary to the formation of the Prussian blue. Resolving, therefore, to put the idea to the test, we at once added the iron solution, and the moment contact between the two liquids occurred, the blue color showed that the formation of Prussian blue had, to a certain extent, been the result. After the addition of a solution containing 11½ minims of solution of perchloride of iron, and 8¼ grains of green vitriol, muriatic acid was added till the excess of magnesia and the excess of proto-peroxide of iron had been dissolved. Prussian blue was left in abundance. On now at once filtering, and adding to the filtered liquid a few drops of a solution of persalt of iron, no Prussian blue was formed,* showing the absence of any ferro-prussiate. On now adding aqua potassæ to neutralize the excess of acid, and throw down the iron in solution, no tinge of blue was produced, not even on adding an excess of dilute muriatic acid. The precipitate

* When freshly-precipitated Prussian blue is rubbed up with calcined magnesia in considerable excess, after a short time, the mixture having been collected upon a filter and washed with distilled water, it will be found that almost all the Prussian blue has been converted into proto-peroxide of iron, along with a simultaneous corresponding formation of ferrocyanide of magnesium, as may be proved by the addition of a solution of a persalt of iron to the filtered liquid, whereby almost all the Prussian blue is reproduced. This reaction does not take place when an excess both of magnesia and of the iron solution is used, as in the case of the antidote; for, if the mixture of Prussian blue, proto-peroxide of iron, and magnesia thus obtained be digested for a long time with water, and that at the temperature of the living body, barely a trace of Prussian blue is produced upon the application of a solution of persalt of iron to the filtrate. In this case, the excess of iron in the form of precipitated oxide, along with the Prussian blue, appears to prevent the Prussian blue from being decomposed by the magnesia, as would occur with this substance by itself. Two explanations of this remarkable result suggest themselves; either a compound, stable towards magnesia, may be formed between the Prussian blue and the proto-peroxide of iron, or this last substance by enveloping, and thus shielding the Prussian blue from the action of the magnesia, may prevent the result that would otherwise be produced.

entirely dissolved to a clear solution. The complete absence of prussic acid was thus proved. All of it had been completely removed.

We prepared as above another quantity of magnesia emulsion mixed with prussic acid, and, after adding the iron solution, the liquid, having been filtered from the mixture, was without delay distilled, and on testing the distillate, it neither answered to the Prussian blue nor to the silver test; it contained no prussic acid.

We believe ourselves justified in now giving, as the antidote for prussic acid, magnesia and a proto-persalt of iron, thus:—Make into a smooth cream, with water, from 1 to 2 drachms of calcined magnesia. Give the emulsion to the patient, then give, in water, a solution of 16 minims of perchloride of iron, and 12½ grains of green vitriol. These numbers, being in excess of the theoretical quantity, were those used in our experiments. Should it be supposed that so much as 400 minims of medicinal prussic acid had been taken, of course four times the quantity of the iron compound necessary for 100 minims should be given, but without altering the quantity of magnesia.

Although calcined magnesia, *alone*, slowly dissolves in prussic acid, yet in the presence, simultaneously, of a large excess of magnesia and the solution of a proto-persalt of iron, the reciprocal action resulting in the formation of a Prussian blue, seems to be almost instantaneous.—*London Pharm. Journal, Nov.* 1, 1865.

PREPARATION OF CARBOLIC (PHENIC) ACID.

By M. Muller.

Phenic acid or phenilic alcohol is usually accompanied by its congeners, xylic and cressylic alcohols, which adhere to it with great tennacity, and give it the property of becoming brown in contact with the air. For its purification the author has recourse to a partial neutralization, and afterwards to the fractional distillation of the product.

The crude tar cedes to soda or lime water a mixture of the matters before mentioned, as well as naphthaline, which is solu-

ble in concentrated solutions of the alkaline phenates. Water is added to this until it ceases to cause a precipitate, when the liquid is exposed in wide vessels, to facilitate the formation of the brown bodies and their deposit. After filtering, the approximative quantity of organic matter held in solution is determined; formed principally of phenic acid and its congeners, which are easily displaced by acids.

The phenic acid always is the last to separate, so that it is easy to disembarrass it of its associated matter and brown oxidized products by adding carefully the proportion of acid determined by calculation, so as to precipitate at first only these matters, and by means of several trials it is easy to arrive at the proper point to stop, so as to retain the phenate nearly pure. The acid is now separated and rectified, and soon crystallizes. As a little water prevents its crystallization, the author removes it by passing a current of dry air over the phenic acid nearly boiling.

The crystallization is facilitated by cooling, or by the introduction into it of a small quantity of the crystallized acid.

The author insists on the necessity of exposing the alkaline solution of the acid for a long time to favor the resinification and deposition of the brown matters; phenic acid is always impure when it is colored.

It should be quite pure when employed to make picric acid, because the impurities waste the nitric acid.

Phenic acid often contains a fetid substance, which appears to be a sulphuretted compound of phenyl or cresyle. It is removed by rectification from oxide of lead.—*From Zeitsch. fur Chem., in Journ. de Pharm.*, Nov., 1865. W. P.

MANUFACTURE OF GLUCOSE.

By M. Maubre.

In this process the saccharification is made at the pressure of six atmospheres, produced by steam issuing from a boiler at 320° F. The boiler is of iron plate, lined with lead; it contains a leaden tube furnished with holes, and is provided with waste-pipes, valves, etc.

Twenty-eight kilogrammes (61½ lbs.) of sulphuric acid, at 66° B. are diluted with 5600 kilogrammes (12337 lbs.) of water, and heated to 212° F. On the other hand, a similar quantity of liquid, at 86° F., is mixed with 2240 kilogrammes (4935 lbs.) of starch and heated to 100° F., agitated constantly, and introduced little by little into the open boiler, heated by steam till it is at 212° F., when the boiler is closed and heated to 320° F., and maintained at this temperature during some time. In from two to four hours the presence of starch is not detected by tests, when the solution is drawn off into a wooden vessel and incorporated with 168 kilogrammes (372 lbs.) of carbonate of lime suspended in 500 kilogrammes (1101½ lbs.) of water, allowed to deposite till clear, drawn off, and evaporated to 20° B., clarified with blood and charcoal, etc., in the ordinary manner. —*Journ. de Pharm.*, from *Mechan. Mag.* W. P.

ON THE PREPARATION OF PYRO-GALLIC ACID AND SOME OF ITS PROPERTIES.

By MM. de Luynes and Espandieu.

Pyrogallic acid, first studied by Berzelius and Braconnot, was the object of remarkable researches by Pelouze in 1834, who, in describing its chief properties, made known the laws which govern its formation. Thanks to Chevereul, Regnault, and Liebig, pyrogallic acid has received numerous and useful applications. Its employment in the analysis of air, in photography, and in dying the hair, give it an important place among chemical products.

The properties and constitution of pyrogallic acid are worthy of the interest of the theorist. We have undertaken these researches to discover its true chemical nature. Although our work is not completed, we believe that these first results are worthy of presentation to the Academy.

The first point which has attracted our attention is the preparation of pyrogallic acid. According to M. Pelouze, gallic acid, heated in a bath to 410° F. in a retort, is completely separated into carbonic acid and pyrogallic acid.

$$C_{14}H_6O_{10} = 2CO^2 + C_{12}H_6O_6.$$

Nothing remains in the retort, or only a residue hardly ponderable. According to this equation, 100 parts of dry gallic acid ought to give 74·1 of pyrogallic acid. Now the processes in actual use do not give a better product than 25 per cent. of the gallic acid. They are therefore very far from satisfying theory.

M. Dumas, in his lectures, has often insisted on the necessity of weighing bodies which are being operated upon, and afterwards of weighing their products of decomposition, so as to discover the discrepancies which exist between practice and theory.

Now the separation of gallic acid into pyrogallic and carbonic acids is not doubtful, consequently its preparation must be defective.

Yet this preparation has attracted the attention of eminent chemists. In 1843, M. Stenhouse indicated the process generally adopted of subliming the acid in cones of pasteboard. In 1847, M. Liebig obtained a result of 31 to 32 per cent. by mixing gallic acid with double its weight of pounded glass in a glass retort, heated by an oil bath and by effecting the sublimation in a current of carbonic acid gas.

If practice conducts to results so far from those which theory indicates, it follows that substances like pyrogallic acid, orcine, and all analogous compounds, though volatile without decomposition at certain temperatures, decompose at these same temperatures when they are exposed during a long time. That which renders the distillation of these substances impossible under the ordinary pressure, is therefore an affair of time and mass; and a stronger reason for the greater destruction of the material is when the distillation is preceded by a chemical decomposition like that which occurs during the preparation of pyrogallic acid.

Guided by these considerations, we have sought to separate gallic acid completely into pyrogallic and carbonic acids, by submitting it to the action of bases and water in close vessels, as one of us has done for the preparation of orcine; the reaction worked well, but the manipulations necessary to separate the base are too complicated. We have determined that, at the temperature of 392° F., the pyrogallic acid remains combined with the lime,

and that the carbonic acid is nearly altogether driven off. We then had recourse to pure water, and the results obtained have surpassed our hopes.

We introduce into a bronze boiler gallic acid, with two or three times its weight of water. Elevate the temperature from 392° F. to 410° F., maintain it during half an hour, and allow it to cool. The operation extends through one and a half to two hours. On opening the boiler, which contains a slightly-colored solution of pyrogallic acid, it is heated with a little pure animal charcoal, filtered, and evaporated over a naked fire, to remove the water. By cooling, the pyrogallic acid crystallizes under the form of a hard mass, of a light amber or sometimes rose-color. To have it quite white, it suffices to distill it in a vacuum. The product is equal to the theoretic yield, sometimes a little greater, owing to the retention of a little water by the pyrogallic acid.

The boiler which has served our purpose is formed of a Papin's digester, and we employed a disc of pasteboard as the packing for the cover joint. We were astonished, in our first essays, not to find the carbonic acid, which passed through the joints, whilst the vapor of water is retained. We have determined the disengagement of carbonic acid by enclosing within the boiler tubes of glass full of lime and baryta waters, which were transformed into carbonates.

The distillation of pyrogallic acid in a vacuum of two to three centimetres is made with great rapidity, and nearly instantaneously. M. Dumas has often called the attention of chemists to the advantage and even the necessity of distilling organic substances at low temperatures, by operating in the vacuum. The new pneumatic apparatus of M. Deleuil could be usefully applied in these circumstances.

M. Bayard, at the request of M. Regnault, has first tried this pyrogallic acid, and M. Bertall has kindly compared the crude acid prepared by our process with the sublimed acid, which they generally use. The trials made in their work-rooms by means of the crude acid prove that it is quite equal to the sublimed acid.

We have studied the action of pyrogallic acid on bases. We

have obtained with ammonia a crystalline combination analogous to that which it formed with orcine. Pyrogallic acid forms with quinine a compound remarkable for its indifference to crystallization. Finally, the chloride of acetyle reacts on it by disengaging hydrochloric acid and in forming a crystallized product, which contains acetic and pyrogallic acid, the composition of which we expect to determine. We would have postponed the publication of these results if we had not believed it our duty to make known the new method of preparing pyrogallic acid, which is the principal object of this note.

These experiments have been made in the laboratory of the Faculty of Sciences of Paris.—*Journ. de Pharm.*, Nov., 1865.

W. P.

PEPPER.

By John R. Jackson.

Of all the senses with which we are endowed, that of taste is perhaps the most fastidious; unlike the senses of sight and hearing, it is not so varied or widely affected by the force of education. To hear and appreciate the eloquence of an oration, needs some cultivated refinement, and is, in consequence, the belonging of a class. As applied to the sight, the same may be said of a fine picture or other work of art; but with the senses of taste and smell, the case is different, though refinement and education undoubtedly lend a helping hand to the full appreciation of both. With the former, however, the likes and dislikes are more affected by nations than classes, and this, in a great measure, is doubtless to be attributed to the diversity of the products of each clime, the love for which is inherent in its people. For example, where can an Englishman find fare so well suited to his palate as in his own land? And a similar question may be asked of other nations; and yet there are countless productions of foreign lands, the uses of which have not become general with us solely through prejudice; and this applies not alone to articles of food, but also to materials useful in the arts and manufactures. It needs a persevering energy to bring new products into the English markets, and it needs even more to persuade the British public to give a fair trial to such products,

many of which might become a source of commercial profit, besides being advantageous to the consumer. As an example of this, the most familiar illustration is tea, which, but 200 years since, was scarcely known in this country, the Dutch East India Company having sent, in 1664, two pounds as a present to the king. When, however, an importation of a few pounds took place three years later, there was probably some prejudice against its general adoption. We venture to doubt that, as a new commodity in our own day, the pure aroma of tea would find little favor at first with the general public, though now, thanks to the energy and enterprise of modern commerce, the tea trade employs upwards of 60,000 tons of British shipping, besides bringing an enormous revenue to the Government. What we have said of tea, might also be said of many other products, including pepper, with which we now propose to deal; even Pliny of old expresses some surprise that an article, as he says, possessing neither flavor nor appearance to recommend it, should become of such general use as it had in his day.

In a commercial sense, the word pepper has scarcely any restrictions or limit; nearly everything hot or pungent comes under the designation. Thus, we have cayenne pepper, which, in reality, is produced from various species of capsicum; melagueta pepper, the seeds of *Amomum Melagueta*, and Ethiopian pepper, the fruits or *Habzelia Æthiopica*. These, in the customs returns, are all classed under the head "pepper," so that it is difficult to tell the exact amount of true pepper imported; but, in a botanical sense, pepper is known as the product of one plant only, and that the *Piper nigrum*. To show the importance of this article in British commerce, as well as the large revenues it brings to the Treasury, we cannot do better than briefly trace the history and development of the pepper trade. It seems pretty clear that its uses were well known to the ancient Greeks; as a medicine, it was also early known, being employed as such by Hippocrates. We quote the following interesting paragraph from Simmonds's "Commercial Products of the Vegetable Kingdom:"—Pliny, the naturalist, states that the price of pepper in the market of Rome in his time was, in English money, 9*s.* 4*d.* per pound, and thus we have the price of pepper at least 1774

years ago. The pepper alluded to must have been the produce of Malabar, the nearest part of India to Europe that produced the article, and its prime cost could not have exceeded the present one, or about 2*d.* per pound. It would most probably have come to Europe by crossing the Indian and Arabian Ocean with the easterly monsoon, sailing up the Red Sea, crossing the Desert, dropping down the Nile, and making its way along the Mediterranean by two-thirds of its whole length. This voyage, which, in our time, can be performed in a month, most probably then took eighteen. Transit and customs duties must have been paid over and over again, and there must have been plenty of extortion. All this will explain how pepper could not be sold in the Roman market under fifty-six times its prime cost. Immediately previous to the discovery of the route to India by the Cape of Good Hope, we find that the price of pepper in the markets of Europe had fallen to 6*s.* a pound, or 3*s.* 4*d.* less than in the time of Pliny. What probably contributed to this fall was the superior skill in navigation of the now converted Arabs, and the extension to the islands of the Eastern Archipelago, which abounded in pepper. After the great discovery of Vasco de Gama, the price of pepper fell to about 1*s.* 3*d.* a pound, a fall of 8*s.* 1*d.* from the time of Pliny, and of 4*s.* 9*d.* from that of the Mahomedan Arabs, Turks, and Venetians." The pepper plant (*Piper nigrum*, L.,) is a native of the coast of Malabar and the southern parts of India, but is now largely cultivated in the East and West Indies, Sumatra, Borneo, Siam, and other places within the tropics. It is a perennial with a climbing shrubby stem; the berries or fruit are borne upon a spadix that is arranged in dense clusters round a central stalk; each of these spadices contains from twenty to fifty berries. The propagation of the pepper plant is chiefly by cuttings, though they will grow well from seed, but of course the plants take longer time before they come into bearing, which is a great consideration when pecuniary profit is the aim. The richer the soil, the better the plants thrive. In forming a plantation, the grower will take his cuttings and plant them perhaps from seven to twelve feet apart. The climbing habit of the plants renders it necessary to provide some support for them to trail upon.

Each individual plant is supplied with some kind of prop, but in many plantations, these supports are cuttings of some spiny or thorny tree, which, striking in the ground and throwing out its leaves above, furnishes at once both a support and shelter for the young pepper plant. If grown on a rich soil, the plants will bear fruit in a small proportion, even in the first year, increasing their produce annually till the end of the fifth year, when they yield about eight or ten pounds per plant, and this is about the average produce up to fifteen or twenty years, after which the plants begin to decline, seldom or never surviving beyond the thirtieth year. A pepper plantation has a peculiar yet picturesque appearance, the regular intervals between the plants and the plants themselves carefully trained against their props, gives to it an air of remarkable uniformity seldom seen in the cultivation of other crops. The plants, which, on account of their climbing habits, are technically called pepper "vines," are allowed to run up their supports to a height of three or four feet; the tops are then bent down to the ground, and the young shoots which spring from these are tended with great care and neatly trained upwards. The plantations in Sumatra are said to be models of neatness and cleanliness, all weeds and refuse being carefully removed. The fruits when first formed are green, changing to red, and finally to black. When they make their first change from green to red, they are considered fit for gathering, for, if left longer on the plants, they are apt to drop off, besides losing a portion of their pungency. After gathering, the berries are spread on mats and exposed to the sun to dry; they are then rubbed between the hands to remove the short stalks. This constitutes black pepper; but both black and white pepper are the produce of the same plant; with this difference, that the white is the largest picked berries, gathered at the fullest state of maturity, and denuded of its black outer husk by soaking in water. White pepper, as we all know, fetches a higher price in the market than black, not on account of its greater pungency; for, as we have seen, it has less, losing, as it does, much of that most important principle in the husk of which it is deprived, and also in the process of steeping and bleaching. A good story is told in Mr. Cameron's new book upon

"Our Malayan Possessions," illustrating the ignorance of the directors of companies of the products or basis of the company's operations. The story runs somewhat in the following manner:— The directors of a Bencoolen pepper plantation, alert, as they should be, to the interests of the shareholders, finding that white pepper, which commanded a higher price than black, had as ready a sale, and was, therefore, more profitable, immediately sent orders to the manager of their plantation for greater care to be bestowed upon the plants yielding white pepper than those yielding black. This must have been highly amusing to the growers themselves.

The black pepper vine is indigenous to the forests of Malabar and Travancore. Its cultivation is very simple, and is effected by cuttings or suckers put down before the commencement of the rains in June. The soil should be rich, but if too much moisture be allowed to accumulate near the roots, the young plants are apt to rot. In three years, the vine begins to bear. They are planted chiefly in hilly districts, but thrive well enough in the low country, in the moist climate of Malabar. They are usually planted at the base of trees which have rough or prickly bark, such as the jack, the erythrina, cashew-nut, mango-tree, and others of similar description. They will climb about twenty or thirty feet, but are purposely kept lower than that. During their growth, it is requisite to remove all suckers, and the vine should be pruned, thinned, and kept clear of weeds.

The berries must be plucked before they are quite ripe, and, if too early, they will spoil. The pepper vine is very common in the hilly districts of Travancore, especially in the Cottayan, Meenachel, and Chengaracherry districts, where, at an average calculation, about 5,000 candies (of 500 lb. each) are produced annually. It is one of the Sircar monopolies. It may not be irrelevant to mention here the *P. trioicum*, Roxb., which both Dr. Wright and Megnel consider to be the original type of the *P. nigrum*, and from which it is scarcely distinct as a species. The question will be set at rest by future botanists. The species in question was first discovered by Dr. Roxburgh, growing wild in the hills north of Samulcottah, where it is called, in Teloogoo, the "Merial-tiga."

It was growing plentifully about every valley among the hills, delighting in a moist, rich soil, and well shaded by trees; the flowers appearing in September and October, and the berries ripening in March. Dr. R. commenced a large plantation, and, in 1789, it contained about 40,000 or 50,000 pepper vines, occupying about fifty acres of land. The produce was great, about 1000 vines yielding from 500 to 1000 lb. of berries. He discovered that the pepper of the female vines did not ripen properly, but dropped while green, and, when dried, had not the pungency of the common pepper; whereas, the pepper of those plants which had the hermaphrodite and female flowers mixed in the same amount was exceedingly pungent, and was reckoned by the merchants equal to the best Malabar pepper.

Several varieties, both of black and white pepper, are known in commerce. Of the black, the most valuable comes from Malabar, and is known as Malabar pepper. It is very clean, and free from dust and stalks. Penang and Sumatra pepper are also varieties of black, known in the markets; the former has, perhaps, a larger berry than the Malabar; but, unlike that, it is very dusty. Sumatra pepper is the commonest, and, consequently, the cheapest; it is very dusty, and has a large proportion of stalks mixed with it. Of the white kinds, Tellicherry pepper is the most valuable, fetching a much higher price than any other of the white varieties: the berries are also larger, and of a purer white. The common white pepper of our shops is imported chiefly from Penang, and varies in price, according to size and whiteness; much of the white pepper, however, as seen in trade, is nothing more than the black Penang sort, bleached in England. Besides these varieties, there is a kind of bleached black pepper, the bleaching of which is effected by chlorine.

Great as is the consumption of pepper, the high rate of duty imposed upon it tends to cripple the full development of a trade which might become of vast proportions. An ample illustration of this fact is found in the increased consumption of pepper in the years following a reduction of the duty. In the early part of the present century, the impost levied was as much as 1*s.* to

2*s*., and even 2*s*. 6*d*. per pound, while the cost price in Singapore ranged no higher than from 6*d*. to 8*d*. In proportion as the duty was lowered, so the price of pepper fell, and the consumption became likewise proportionately greater. The prime cost of Singapore pepper, at the present time, does not exceed 1*d*. or 1½*d*. per pound, and that from Malabar, Sumatra, and Penang, about 4*d*., while white pepper fetches from 9*d*. to 1*s*., and perhaps 1*s*. 6*d*. In Singapore, where immense pepper plantations exist, the cultivation is chiefly carried on by Chinese settlers, who, owing to the heavy impost in this country, to which the bulk of their produce is shipped, find it a very poor and scarcely profitable speculation, requiring, as the plants do, so much care and attention. From the foregoing facts, it is easy to see that, were the present duty of 6*d*. per pound reduced, we might expect a corresponding increase in our importations, which would probably add to, rather than diminish, the public revenue, for we might safely depend upon the use of pepper becoming more extended, so generally appreciated as it is.

The plant which furnishes melaguetta pepper, or grains of Paradise, now pretty well known to botanists, seems remarkable for its variable size, especially as shown in its fruit. According to Dr. W. F. Daniell, the variety grown at Accra is the largest. The smaller, which grows on higher ground, is called in Fernando Po, *Toholo M'Pomah*, or M'Pomah pepper.

Specimens of the flowers of each variety are desirable to ascertain if they belong to one and the same species.

Of bastard or false melaguetta peppers there are several beautiful species, quite distinct and different from each other, and very imperfectly known to botanists. The fruit of some of them is used by the blacks for the sake of its acrid pulp, which is agreeable to the taste. They are tall, flag-like plants, with handsome flowers and fruits produced near the roots. Melaguetta pepper, true or false, belongs to the botanical genus *Amomum*.—*Lond. Pharm. Journ., Nov.* 1, 1865, from *Technologist*.

ON COTTON-SEED OIL, AND ITS DETECTION WHEN MIXED WITH OTHER OILS.

BY R. REYNOLDS, F. C. S.

In the year 1785, the Society for the Encouragement of Arts and Commerce offered a prize for the successful manufacture of oil from cotton-seed, but it has not yet been awarded. The difficulties in purifying the expressed oil seem to have been insuperable for a long while, though for several years past the oil has been coming into use in the United States. In our own country, trifling quantities have been produced during the last dozen years or so, but at the present moment a very considerable quantity is being expressed in England.

There is too much reason to believe that nearly the whole of this is used in the sophistication of oils of older repute. The probability that the supply will now continue and increase is specially indicated by a consideration of the source of the oil. The weight of the seed yielded by each cotton plant is about three times as great as the cotton obtained from it, and up to the present time nearly the whole of this seed has been wasted, or returned to the soil as a fertilizer. The present price of the refined oil is less than 3*s*. per gallon, and, considering the large proportion of seed that has yet to be utilized, it is probable that it will long continue to be the cheapest fixed oil in the market. Hence the desirability of our giving some attention to a substance which is pretty sure to present itself to us in our daily avocations in some shape or other.

As might have been expected, cotton-seed oil has been noticed in the literature of our American brethren. Thus, in 1856, Mr. Wayne brought it under the notice of the American Pharmaceutical Association, and in 1861 it formed the subject of an inaugural essay by Mr. Weatherley, (Pharm. Jour. N. S. vol. iii. p. 80.).

Mr. Weatherley's essay well deserves attention. The author repudiates much of the discredit thrown upon the oil on account of its asserted drying qualities, and says that it answers well for both burning and lubricating.

Mr. Weatherley made some experiments in substituting "winter-bleached" cotton-seed oil for olive or almond oils, in various pharmaceutical preparations. He states that cold cream, spermaceti ointment, citrine ointment, and some liniments were so prepared, and fully equalled the results of the officinal formulæ.

In England, Dr. Adriani has studied the properties of this oil (Chem. News, Jan. 7, 1865.) He states that the crushed seed is heated to about 180° Fahr., and then pressed, when 15 to 18 per cent. of a dark brown-red oil is obtained. The specific gravity is ·930 or ·931, and in this respect, as well as in taste, odor, and drying qualities, it has much resemblance to linseed oil, from which, however, it differs in its darker color. Dr. Adriani has shown that the dark brown-red color possessed by the oil does not pre-exist in the seed, but that it is the result of the oxidation of a yellowish-green principle that is found in the seed, and which may be extracted from it with unchanged color, if precautions to exclude the air be adopted. Much attention has been given in some quarters to the utilization of this principle as a dyeing agent, but without successful results.

The operation of refining the oil consists chiefly in heating it with a weak solution of caustic potash or soda (the former by preference.) A preliminary treatment of the oil by boiling water, to remove mucilaginous matters, much facilitates the operation. If the crude oil be well agitated with solution of potash without the application of heat, the mixture, after repose, will yield a yellow layer of "refined oil" floating upon an aqueous solution that is nearly black, from the coloring matter extracted from the oil. A singular purple-colored film may also be produced upon the surface. The loss in refining is stated at about 15 per cent.

I have only to add a few remarks upon the detection of this oil when mixed with olive oil. A well-known chemist, whom I regard as the highest authority upon the subject of the adulteration of oils, tells me that he does not know of a test for this purpose.

The experiments which I have made induce me to regard the nitrate of mercury test as affording sufficiently clear reactions to enable us to find this oil when mixed with olive oil.

I have used Poutet's test as follows:—6 parts of mercury are dissolved in 7½ parts, by weight, of nitric acid 1·36 without the application of heat, and form the test solution. The tubes for making these experiments are merely strong test-tubes of 7 inches in length, and holding about a fluid ounce. They are roughly graduated by pouring in 30 minims of water and scratching a line upon the glass; another line is made at the point reached when a total of 6 drachms of water have been poured in. The lower line is marked "test," the upper one "oil." Pour in first the test to its mark, and fill up with the suspected oil to the other line; shake well and set aside, shaking again about an hour afterwards. In from three to twelve hours, according to the temperature, etc., a genuine olive oil will have solidified entirely, the product after the latter interval being quite hard when touched by a glass rod. Cotton-seed oil, when similarly treated, will not solidify, but remains fluid. A mixture of 24 parts of cotton-seed oil, with 75 parts of olive oil gives an intermediate condition. The contents of the tube become solid, but if a little be taken out with a glass rod, it is found to be soft, pasty, and without any friable character. On the other hand, when pure olive oil is so treated, the product is hard, friable, and not pasty. Comparative trials should always be made, and caution exercised in accepting the apparent conclusions. Where only 12½ per cent. of cotton-seed oil is present, the reactions are not so distinct as with 25 per cent., but I consider them usually sufficient to decide the case.

I believe that when the adulteration of olive oil is so prevalent as at the present time, it is the interest of the members of the drug trade to use this test themselves, and also, in many cases, to inform large consumers how easily it is applied.—*Proceedings of British Pharm. Conf. in Pharm. Jour., London, Oct.* 1, 1865.

ON LIQUIDAMBAR STYRACIFLUA AND ITS BALSAMIC RESIN.

By William Procter, Jr.

According to Michaux (Sylva Americana), Liquidambar styraciflua is the most extensively diffused of all the forest trees of North America, being found as far north as 43° 30′ on the Atlantic coast, and as far south as old Mexico, spreading westward as far as the Illinois river, and southward thence to the Gulf of Mexico. Sweet gum is its most common name, but in New Jersey it is known as *linn*, and in Louisiana it is called *copalm*. It is probably largely found in Texas, and some of the largest specimens were seen by Michaux in Georgia, between 5 and 6 feet in diameter, and W. P. Creecy speaks of specimens in the State of Mississippi 100 feet high. In New Jersey I have seen the tree 60 feet high and 2½ feet in diameter. From an early period it has been known that this tree affords, both spontaneously and when wounded to the sap, a soft resinous exudation, which is known by the name of *sweet gum*, and used as a masticatory. There are two forms of this exudation which are described by Guibourt in his Histoire des Drogues, as coming from Mexico and Louisiana. One soft and resinous, becoming brittle by age and analogous to tolu in consistence, the result of spontaneous exudation and hardening on the bark. The other a transparent oleoresinous liquid, like copaiba in consistence, and obtained, by incision, immediately into the vessels in which it is kept to avoid the action of the air upon it. According to Guibourt these products contain considerable quantities of benzoic acid, and have the odor of storax. In vol. vi., page, 190 of the American Journal of Pharmacy, William Hodgson, Jr., states, that 1000 parts of the balsam procured from Louisiana, yielded, by boiling with soda and precipitation by an acid, 42 parts of benzoic acid, and he thinks as much as 6 per cent might be obtained with careful manipulation.

Prof. C. W. Wright, of Kentucky (see Am. Jour. Pharm. vol. iv., new series, 1856, p. 413), says, "When an incision is made through the bark of this tree, a resinous juice exudes which possesses an agreeable balsamic odor; at first it has the consistence

of turpentine, and has a stronger smell than after it has become resinified. Contrary to the statements made in the U. S. Dispensatory this tree furnishes a considerable quantity of resin in the Middle States bordering upon the Ohio. It is annually collected and sold under the name of gum wax. By proper incisions the tree will yield annually about three pounds of the resin." Prof. Wright says its composition is *benzoic* acid, volatile oil, styracin, &c., which accords with Bonastre.

In 1856 the writer sent a specimen of this balsam, obtained at Cincinnati, to Mr. Hanbury of London, who in a letter on that subject states that the balsamic acid present in it is *cinnamic* and not benzoic acid, as described by Guibourt, Hodgson and others. At the recommendation of the writer this balsam was made the subject of an inaugural essay presented to the Philadelphia College of Pharmacy, 1860, by Wm. Prior Creecy, of Mississippi, (see vol. viii. 3d series of the American Journal of Pharmacy,) who, starting from the suggestion of Mr. Hanbury, sought to determine the nature of the volatile acid matter in the balsam. The results of numerous experiments by Mr. Creecy, seems to prove that the chief volume of the acid present is cinnamic, but that the balsam also contains a smaller portion of benzoic acid. He also found a volatile oily substance, having the fragrance of the balsam, in small quantity, besides a large quantity of resin.

These are the principal observations I have been able to collect in reference to this subject, and now will make a few remarks pointing more directly to the question called for by the query of 1863.

In the fewest words this query asks, whether the Liquidambar of the United States will yield a product similar to storax, if treated like the Liquidambar orientale, the source of that drug. Now, according to Mr. Hanbury's account (Pharm. Journ. 1857,) liquid storax is prepared by removing the outer bark of the latter tree, and scraping the inner live bark which causes it to secrete the storax balsam, which is then scraped off together with parts of the bark and purified by boiling it in large copper boilers, during which probably the moisture of the inspissated juice is evaporated and the extraneous bark removed; when it is strained into casks. Another account says, that the inner bark itself is boiled and sub-

sequently expressed to remove the balsam, and that the residual bark is the storax bark of commerce. Viewed from the standpoint afforded by the American tree. I should be more inclined to believe the former account was the correct one, and that in the heating process, which is probably carried out without much care, the whole mass acquires a uniform adhesive texture, and a semi-empyreumatic odor, points which chiefly distinguish the oriental balsam from its American analogue.

Earnest endeavors were made after the last meeting to obtain some practical experiments on the tree as it grows in Tennessee, Arkansas, and other places from friends residing in those localities; but all my correspondents failed me except my friend Hennell Stevens, Medical Storekeeper U. S. Army, at Memphis, who sent me a small specimen of the balsam obtained by incising the bark transversely, and another vial of balsam the result of natural exudation. The main point was not reached; owing to the disturbed condition of all the country where the temperature is favorable to the process, and for want of the time necessary to make the experiment, it has not been possible to get the results required. In the month of May last, I determined to try some experiments on the New Jersey tree. The first was about 30 years old and a foot in diameter, growing in a high and dry soil unfavorable to its development. A portion of the outer bark was removed, and the exposed live bark wounded by bruising, so that it cracked in several places. In July the inner bark was found to be entirely dead, and beneath the dead bark where it joined the upper edge, an exudation of soft resin was found, like that from the southwest in odor and taste. Another experiment was tried upon a tree growing near water, two and a half feet in diameter, with no better success. The same balsamic exudation after a time, but too limited in its quantity and too slow in its secretion to meet the case required. It should be observed that the bark itself, when recently cut, possesses no aroma like the balsam. The latter does not, like the turpentine, circulate in the juices of the plant, but appears to be due to the action of air on those juices where a rupture of the tissues takes place, being apparently an effort of nature to heal the abrasion. When the inner bark, free from contact with the oleo-resin, is triturated with a little water,

and permanganate of potassa is added, no indication of cinnamic acid occurs. Now this fact may not be true of the tree in all localities. At the south-west the bark may be resinous in its nature, and imbued with a balsamic odor, and thus approach more nearly in character the oriental species.

I am informed that in the lower counties of Delaware and Maryland the farmers are in the habit of collecting the balsam under the name of "gum wax" for use as a masticatory, and as an application for corns. By means of a hatchet a narrow transverse section of bark is removed, the incision being made at an angle of 45°, so as to form a sort of pocket in which the resin exuding from the upper side of the wound collects. It is often as colorless as turpentine and always exceedingly adhesive, and mostly sought from trees of two or two and a half feet thick.

Michaux casually observes that in repeated experiments in Carolina, trees a foot in diameter afforded but half an ounce of exudation in a fortnight.

It may be proper here to notice a letter received soon after the meeting of 1864, from Mr. Daniel Roemer, of Cincinnati, who had resided in Mexico: "Sir you have continued to you the query, 'will Liquidambar s. yield a product identical or nearly so with storax, &c.' A great quantity of *liquid storax* is produced in Mejico; from what plant I am unable to say; it is very black upon the top, and the dark color penetrates generally somewhat deeper than in the commercial storax. It is so plentiful that the Mejican Pharmacopœia directs Emplast. Hydrargyri to be made with it; and it must be of excellent quality, as the French perfumers (Mejicans are too civilized and too aristocratic to use any other than French perfumery,) use this in place of the imported storax whenever they need it, which is undoubtedly a great testimony to its excellence." M. Roemer was unacquainted with the botanical source of this native storax, but referred to an eminent Pharmaceutist of the city of Mexico, Don Leopoldo Rio de la Loza, who he believed could give information about it. Whether this Mexican storax is really a product of the Liquidambar or of a tree of the genus Myrospermum, I am wholly at loss to determine, but deem it a subject of interest.

It may be apposite to refer to the bark recently noticed in the

Journal of Pharmacy by Prof. Mayer, which came into New York commerce, under the name of *sacred bark*, as in his opinion probably a product of Liquidambar Altingiana *of Blume*, and to which one of the varieties of storax is attributed by some writers, contrary to Mr. Hanbury, who inclines to refer it all to the species orientale. The fact that Prof. Mayer detected cinnamic acid in this bark, and a soft resin with a storax-like odor, renders it interesting to know whether it really belongs to some species of Liquidambar; for, unless it can be shown that this acid may be secreted in the natural tissues of one species and not in others, it is an argument against that origin of the bark in question.

Having in my possession a few ounces of the "sweet gum" which I had kept in my cabinet for eight years, it was determined to make a few experiments with it in reference to the volatile acid present.

Half an ounce of the balsam in fragments, was put into a small iron capsule, covered with filtering paper held closely by paste, and a small Mohr's subliming cap of pasteboard applied over it, gas heat was gradually applied as long as crystals collected in the cap. The quantity was much smaller than an equal weight of benzoin would have yielded, but in appearance they were like benzoic acid. Examined with a lens they presented the form of flattened needles, some of which have oblique terminations. Placed on mercury, in which a thermometer dipped, and heat applied, they partially fused when the mercury arose to 260° F., when at 280° the crystals dropped upon the mercury instantly melted. They are soluble in cold strong nitric acid, and on standing a short time produced an abundant crystallization of nitro-cinnamic acid. When heat is applied to the solution, nitric oxide is evolved with ebullition, a few crystals mixed with a little permanganate of potassa instantly developed the oil of bitter almonds.

Half an ounce more of the sweet gum, in coarse powder, was boiled with milk of lime, water being added several times, until apparently exhausted, the amber colored liquid filtered and allowed to stand until cool. No precipitation occurred; on again heating and adding muriatic acid in slight excess a crystalline precipitate fell, which when collected and dried weighed about eight grains. These crystals afforded oil of bitter almonds with

permanganate, fused readily at 260° F., and yielded nitro-cinnamic acid with strong nitric acid. It is evident from these results that but little if any real benzoic acid exists, and that Mr. Creecy's experiment with the sublimed acid, testing by chlorinated lime, must have been imperfect, as a sublimate obtained in these experiments instantly developed oil of bitter almonds, in contact with permanganate of potassa. It is also evident that the earlier observers, Bonastre and Hodgson mistook cinnamic for benzoic acid.

The leaves and capsules of the sweet gum both give a somewhat aromatic odor when bruised, and are both decidedly acid to the taste and to litmus. When the green capsules are bruised and thrown into alcohol they become brown after a few hours, and afford a brown transparent tincture decidedly acid to litmus paper. The tincture of the fresh leaves made with alcohol ·817 is green, decidedly acid and very astringent. When a per salt of iron is added a deep bluish black color is found, the greater part of which is discharged by heating to 212° F. It is highly probable that gallic acid exists to a considerable extent in these leaves, but I have not had time to verify the supposition. According to Prof. C. W. Wright, of Kentucky, the bark contains so much tannic and gallic acid as to be valuable as a remedy in diarrhœa.

In concluding this paper, the writer regrets that he has not been able to decide the question he had proposed to himself, viz: the preparation of liquid storax corresponding with that of the Levant, yet without asking a continuance of the subject he still hopes to accomplish it, now that access is to be obtained freely to the south-west.

Philadelphia, Sept. 1, 1865.

ON THE CULTIVATION OF VANILLA IN MEXICO.*

The vanilla is a climbing plant, and, like the ivy, rises from the ground by the help of the trees, which it finds, and which it almost covers with its foliage. Its stem, which is of the

* From Müller's Reisen in den Vereinigten Staaten, Canada und Mexico, in Vierteljahresschrift f. Pharmacie.

thickness of the little finger, is greenish, fleshy and almost cylindrical, and has, like the vine, occasional nodes and runners. Each node is furnished with a thick opposite leaf, about eight inches long and three wide. Its roots, which penetrate the bark of the tree, find there sufficient nourishment to keep the plant fresh and vigorous, even when the lower part of the stem may have become accidentally injured, or even separated from the root.

When the stem has reached a certain height, it begins to branch, spreads out on all sides, and becomes covered with large flowers, which are greenish externally, but white within. The flower changes in ripening into a pod seven to eight inches long, which is filled with an oily mass of small, black, shining seed. The plant commonly grows in the forest, in uncultivated, moist places, which are often overflowed, and become covered with rank vegetation. To propagate it, it is sufficient to plant cuttings, taken off near the lower part of the stem, which soon take root and send up shoots. If these shoots are allowed to spread upon the earth, or over the tangled underbrush, the fruit becomes exposed to the danger of spoiling, to prevent which the young plants are bound to the trees a short distance above the ground, on the bark of which they immediately take root, and grow downwards towards the earth. Air roots are sent out, which, seeking the ground, soon obtain a more secure footing than those cuttings which are committed entirely to the soil, which latter frequently decay or wither.

The vanilla ripens generally about the end of March, and the harvest lasts about three months. In its fresh condition it has no smell which would particularly remind one of that excellent aroma it acquires during the preparation which it undergoes. This valuable plant grows wild in many parts of the Mexican Territory, as also in the ever green, warm and damp forests of Cuba, and there is nothing else necessary to be done by the natives than to gather and dry its aromatic fruit, a process which was formerly kept as a secret, but which was soon acquired by the Spaniards.

The vanilla plant flourishes on the East Coast, and also in the Western Departments of the Cordilleras, in the States of

Vera Cruz and Oaxaca, between the nineteenth and twentieth degree of north latitude. The natives, familiar with the difficulty of penetrating far into the wilderness of forest, and the almost impassable thickets, in search of the fruit, which, moreover, does not ripen always at a certain time, have adopted a mode of planting by which, in the comparatively small space of a few square miles, a considerable number of plants have been introduced, whose culture requires neither effort nor care. All that is necessary is to clear the ground around the trees in the forest which it is intended to plant, and to set two cuttings at the foot of a trunk, or to fasten a few small pieces of the vine upon a young tree, in the bark of which they immediately take root, send down air-roots to the ground, and soon obtain a secure footing. The Indians prefer to select the trees yielding balsamic resin, oil or gum, which, besides serving to support the vine, may also exert a more or less favorable influence upon its agreeable smell. The cuttings are generally 32 to 36 inches in length. The vanilla begins to bear fruit in the third year after planting; each shoot affords yearly about fifty pods, and continues to yield this number for thirty to forty years, particularly if its growth has not been obstructed by rank weeds or stifled by climbing plants. The wild vanilla, (*la vanilla* cimarona,*) occurring in even the thickest part of the jungle, affords only very small and dry fruits, which are not prized; when the vines, however, of this plant are transferred to a cleared and prepared soil, its pods become similar to those of the best cultivated vanilla, (Vainilla criolla.)

The points most noted for the cultivation of, and trade in vanilla, are the Indian Villages of Misantla, Coliba, Yucuantla, in the state of Vera Cruz, Nantla, Santiago, San Andres de Tuxtla, Jaquila, Sacatepec, and several other places in the western division of the Cordilleras, in the State of Oaxaca, as also in the States of Tobasco, Chiapas and Yucatan. The Indians of Misantla gather the vanilla in the mountains and forests of Quilates, where the plant blooms in February and March. The harvest is of little value if, during this period, powerful

* The name vanilla, properly vainilla, is the Spanish diminutive of *vaina*, (pod. legume,) thus signifying a small, thin pod or legume.

north winds occur, accompanied with heavy rain, beating off the blossoms, nor if the dampness of the season is too great or long continued. Excessive dryness also injures the growth and value of the vanilla.

On account of the glutinous, milky juice which the green pods contain, they are not attacked by worms or by insects. The season of gathering begins at the end of March, and lasts generally to the end of June. The Indians, who remain about eight consecutive days in the forests for this purpose, mostly sell the fresh and yellow pods to the settlers, who make a business of drying, bundling, pressing and otherwise preparing them for sale. In Misantla the usual way of drying the vanilla is to spread the yellow pods upon a linen cloth, and, when the weather permits, to expose them to the sun, and allow them to sweat for a few hours. As soon as they are sufficiently heated, they are wrapped in woolen cloths, *upon which they immediately assume a dark copper color*, when they are again exposed to the sun's rays from morning till evening, until entirely dried. Should long continued rain make it impossible to expose them to the sun until they assume this blackish-brown color, and become covered with silvery spots, it is necessary to have recourse to artificial warmth. For this purpose the natives weave a frame, or a kind of four-cornered sieve, of the Spanish cane or split bamboo, to spread the pods upon, which they hang up by cords and cover with a woolen cloth. This frame is then placed over a fire, which does not smoke, and a gentle vibrating motion given to it. This operation, which is called "el beneficio del Poscoyal," is by far more difficult, and requires long experience and great care that the waste of the product is not too considerable.

In Misantla the prepared pods are packed in bundles of 50 each, which are divided, as follows, into four different classes; since the nature of the soil, the dampness of the air and the sun's heat exert an essential influence upon the bulk and weight of the parts which are charged with oil and with the aroma: (1.) The best vanilla, *la vainilla fina*, with the subdivisions of the large best and small best, *la grande fina* and *la chica fina*, or *la mancuerna;* (2.) el Zacate; (3.) el Bezacate; (4.) la Basura,

(the refuse or offal.) These four kinds are tied up differently, in order to be readily distinguished in commerce. The large best is usually 22 centimetres long, and each bundle weighs, in Misantla, 10½ ounces; in Coliba 9 to 10 ounces. The small vanilla is 17 centimetres long, and is about half as valuable as the former. The Zacate is a very long, but a thin, moist pod, and must be examined and aired, particularly after a long sea voyage, before it goes into the European market. The offal, or refuse, serves as an under and upper layer in the chests in which the better classes are packed for exportation. Each bundle of this sort consists of 100 pods. There are also two other sorts of vanilla, but which are now scarcely ever seen in commerce, viz., the wild vanilla, (la vainilla cimarona, or de palo,) a very thin, dry pod; and the showy or splendid vanilla, (la vainilla poposa,) with very fine, large fruit, but of a different smell from that of the best vanilla, on which account it has not met with a favorable reception in Europe nor in the East.

The neighborhood of Papantla produces comparatively little vanilla, which is besides generally not well dried, but is always very aromatic; the purchasers are, therefore, obliged to dry it carefully over again. The locality of Teutila, in the State of Oaxaca, has acquired a deserved reputation, on account of the celebrated vanilla growing in its surrounding forests. In this place the inhabitants prepare the pods with great care, perforating them with needles on all sides, in order to facilitate the exudation of the milky juice, and dry them strung upon threads.

The forests of Quilates yield in good years about 800,000 pods; in very wet years the yield falls to 200,000. The average annual production in Misantla and Coliba, is about 700,000 pods, in Papantla 100,000, in Teulita 110,000. The harvests of Santiago and San Andres de Tuxtla are very various. The above mentioned productions of the provinces of Oaxaca and Vera Cruz have remained almost the same for a century. In 1802 1,793,000 pods were exported from Vera Cruz; to-day the amount exported is no larger.

PRESERVATIVE AGAINST CHOLERA.

Dr. H. Hager publishes in Vol. vi, No. 34, of his Pharmaceutische Centralhalle, the following:

Cholera is a horrible epidemic, which has paid us repeated visits during the last thirty years; which, like the wandering Jew, finds no mountain too high, no water too deep to cross, no summer too hot, and no winter too cold. Specific remedies for this disease are unknown, because its character is greatly modified by circumstances. The curing of the cholera patients belongs to the physicians; but let us pharmaceutists preserve ourselves against the attacks of this disease as much as possible, in order to maintain our position as the indefatigable preparers of medicines.

The observance of the well known dietetic rules is the first most important condition. Besides, we recommend several preservatives, which we have proved ourselves, and which we and many of our friends have tried, without any one of them having been attacked by cholera.

The best among the preservatives is quinia, which protects against typhus and cholera alike. It is possible that its tonic properties, acting in the general human organism, subdues the disposition to that malady. Its different action in large and small doses must not be overlooked. As preservative, only the roborant action of small doses comes into consideration. A good chinoidine may be substituted for poorer people, and to exert its roborant properties, must be combined with mineral acids.

The following are some recipes for this purpose:

*Pilulæ Prophylacticæ Anti-Choleric*æ.

℞.—Quiniæ sulphatis, gr. 60
Acidi sulphurici diluti, gtt. 40
Pulveris aromatici, gr. 90
Radic. Althææ pulv., gr. 30
Extracti Trifolii, q. s.
M. ft. pilul. No. 120. Consperg. Cass. cinnam.

S. Take two or three pills every morning, noon, and evening, always after meals.

℞.—Quiniæ sulphatis,
Pulveris aromatici, *aa* gr. 60
Acidi hydrochlorici, gtt. 15
Liquoris Ferri sesquichloridi, gtt. 20
Radicis Gentianæ pulv.
Extracti Trifolii, *aa* gr. 40
Olei Cassiæ Cinnam., gtt. 10
Rad. Althææ pulv., q. s.
M. ft. pilulæ No. 120.

S. As before.

℞.—Chinoidini,
Pulveris aromatici, *aa* gr. 60
Mixtis instilla.
Acidi hydrochlorici, gtt. 30
Ferri sesquichloridi soluti, gtt. 20
Post agitationem admisce.
Rad. Gentianæ pulv.,
Extracti Trifolii, *aa* gr. 40
Olei Cassiæ cinnam., gtt. 10
Rad. Althææ pulv., q. s.
M. ft. pilulæ No. 120.
S. As above.

Vinum Anti-Cholericum.

℞.—Tincturæ amaræ,
" aromaticæ,
" Aurant. pom.,
aa unc. 1
" Cassiæ cinnam., unc. 2
Vini optimi, unc. 120
Sacchari albi, unc. 16
M. et solve.
S. A small wine-glass to be taken four times a day during meals, commencing with lunch.

We also call attention to Aqua Anti-Cholerica Meyeri, Potio anti-cholerica de Lovignac, and other preservatives in our Manuale Pharmaceuticum.*

In using one of the above preservatives, a moral strength is gained which excludes all fear of cholera; and they are a strengthening support during the superabundance of business which visits those apothecaries' stores around which the cholera seeks its victims.

A moderate use of quinia, in small doses, for four or eight weeks, is without the least ill effect upon the health. The notion that it produces dropsy, is sheer superstition.

* We copy from this work the formulas, &c., for both preparations:

Aqua Vitæ Meyeris. Aqua Anti-Cholericæ Meyeri.

℞.—Bacs. Myrtillor. rec., part. 18
Cort. aurant. expulp., p. 12
Cassiæ cinnam., p. 8
Radicis galangæ,
Radic. Zedoariæ, *aa* p. 2
Cardamomis, p. 1
Contusis concisisque affunde.
Spir. vini rectificatiss., p. 600
Aquæ, p. 680
Digere per triduum et sæpius agita. Tum exprimendo cola. In colatura sedimentando, decantanto filtramdoque depurate solve.
M. Sacchari albi p. 120.

Potio Anti-Cholerica de Lovignac.

℞.—Quinia sulphatis, part. 2
Ferri iodidi, p. 1
Syrupi gummosi, p. 30
Aquæ destillatæ, p. 100
Misce et agita.

S. Impetus choleræ Asiaticæ quum accedit, dua cochlearia summantur, postea singulis horis singula cochlearia. Excretiones ubi cessare incipiunt et calor in corpus redit, caput glacie in linteo compressa legitur et ægroto aqua frigida porrigitur.

J. M M.

QUINIA AS AN ANTISEPTIC.

Experiments made by Dr. Gieseler with fresh meat, showed that the preservative power of quinia (not sulphate) is much greater than that of many other substances, and suggested to him the idea of employing it in surgical cases. He saw favorable results in cases of gangrene, noma, decabitus, and even in diphteritis; and they were the more marked, since, during his experiments, Dr. G. used also other remedies. Quinia may also be recommended after plastic operations, which frequently are without success on account of the decay of the transplanted parts; he has likewise used it locally, with supposed success, in caries and necrosis after performing the requisite operations. The remedy is used in the form of strong solution, with which compresses are to be wetted; or in considerable proportion mixed with fat; also in the form of linctus, gargle, &c.—*Hager's Pharm. Centralhalle*, 1865, *No.* 33, from *Zeitschr. d. Allg. Œsterr. Apoth. Ver.*, 1865.

THE EFFECTS OF SOIL AND CULTIVATION ON THE DEVELOPMENT OF THE ACTIVE PRINCIPLES OF PLANTS.

By Thomas P. Bruce Warren, Préparateur in the Laboratory of Mr. William Hooper.

To the most casual observer, it is evident that plants which grow on one soil will not grow on another. It does not require an extensive knowledge of botany, to detect that the primary functions of plant life, though similar in all classes, vary in energy in different plants, and even in parts of the same plant; it is the adaptability of the organs for the performance of these functions, which establishes the locale of plant existence.

We are able, by certain means, so to modify the habits of a plant, as to cause it to grow under conditions which are not normally demanded by its nature, or the energy of its functions; from this remark, a plant may be said to be cultivated when grown under constrained conditions.

It would be difficult to define precisely the limits of cultivation, for the removal of a plant from a soil naturally selected by it, or on which it grows, as it were, *sud sponte*, to a soil

equally fitted for its peculiar habits, can hardly be considered as cultivation.

It is, however, more difficult to imitate nature on such a point, than to supply the exact pabulum for a plant, or to sustain those conditions under which a plant grows in a wild or natural state.

The circumstances which I proposed to consider, as affecting the medicinal value of a plant, are:—mutilation, when giving rise to an unnatural development of particular parts; effects of soil, as indicated by the chemical analysis of the soil and plant; and situation, with reference to the supply of air, light, and moisture.

The principle of mutilation is not generally practised, although by suppressing the development of flowers, a larger number of leaves may be obtained. In the case of the Labiatæ, we may, by suppressing the development of wood, produce a larger quantity of oil, but it does not appear that by the mere removal of leaves, a larger quantity of oil is obtainable, more flowers are developed, but the yield of oil is proportionally diminished; this might possibly admit of explanation, from the importance of the functions which the leaves perform in regulating evaporation and supplying air, the main features in the elaboration of the vegetable fluids.

Mutilation will not in every case account for the non-development of any particular organ or part of a plant.

I planted about three years ago, but without determining the suitability of the soil, several slips of rosemary: they have all put out abundance of shoots and leaves, but the number of flowers has been very insignificant; no mutilation has ever taken place. At the same time I laid out several plants of lavender, which became completely exhausted after the second year, and out of forty slips planted at the same time, not one struck; this, I have since discovered, may be explained by the chemical condition of the soil (see analysis in Appendix), and the physical requirements of the plant.

Non-mutilated lavender plants yield considerably finer flowers, when grown on a suitable soil, but the quantity is much less than from plants in which the development of wood is pre-

vented, and the yield of oil is greater in the latter case; the same remark applies, though less forcibly, to peppermint and rosemary.

The injudicious mutilation of lavender plants, explain to some extent the great differences in the yield of oil obtained by different growers.

Mutilation, when practised, should be regulated by the season and exposure of the plant.

I am strongly of opinion that mutilation is not confined to the Labiatæ, although I hesitate to include the result as arising from mutilation, rather than an indication of hybrid development; but it is a singular fact, that henbane plants, when cultivated, show a tendency to capitate inflorescence, whereas the same plants (self-sown) are strongly disposed to a racemose arrangement of its flowers, and in this case an enormous yield of flowers is produced compared with the quantity of leaves. The cultivated plants indicate more or less an axillary inflorescence, and the capitate disposition should perhaps be regarded as arising from an abortive development of the stem.

My experiments on henbane were far advanced when I first observed this, as it was only after flowering that I distinguished any difference in the plants.

In the case of plants, when the unexpanded flowers are gathered, as roses, it would be very desirable to determine whether any difference exists in the medicinal value of the flowers first collected during the season, and those which are gathered near the end, for it is evident that this imposes no less on the energies of the plant, than mutilation in the general acceptation of its principle, and I hope to return to this inquiry at an early period, to determine the difference, if any, which arises through the gradual though unavoidable exhaustion of the plant.

I have performed an extensive series of experiments on this point, to determine whether such plants as belladonna, foxglove, and henbane should be allowed to perfect their flowers or seeds before the leaves are collected for the preparation of medicinal extracts. I find that the amount of active principles contained in the leaves, remains the same both before and immediately

after flowering; it is slightly diminished in the stalks and roots after the fall of the flower, and gradually accumulates in the remaining appendages of the flower.

The maximum accumulation in the seeds and seed-vessels of foxglove and stramonium, I have found to be attained before the seeds change their color.

In the case of belladonna, this is not so strongly marked as in foxglove, henbane, or stramonium.

With good specimens of foxglove recently collected, it is easy to obtain the color reaction of digitaline, by simply moistening the seeds with dilute sulphuric acid.

These experiments have been confined entirely to the biennials, in some cases transplanted so as to be within easy access.

Although I have closely studied the effects produced by cultivation, and have prepared several artificial soils to determine the effects produced by differences of mineralizing ingredients, I regret that the information which may be deduced from my experiments is so limited. This is necessitated by the fact, that it is not easy to detect any differences in the mineral composition of the juices of a plant, which may be raised on soils having a slight difference in their mineral constituents; and since time is required for the indication of a maximum effect on the chemical constitution of a plant, and the degree of acceleration with which such effect is produced, and as my experiments have been limited to a single year, it is not right to infer that the results indicated form the totality of what might under the continuation of the experiment be expected.

There can be no doubt that the continual raising of medicinal crops upon any soil, without supplying the same with manure in some form, must be followed by an alteration in the chemical constituents of the plants; such effects can be determined only by experiments extending over three or four years. From the information which I have been able to gather, it is quite probable that the careful application of manure to medicinal crops is of essential importance, and that merely restoring the saline matter to tbe soil which had been extracted during vegetation will not maintain its productive capacity.

Most growers with whom I am acquainted adopt the princi-

ple of rotation, but the most experienced prefer supplying their land with rich stable manure after each crop. The principle of rotation is ultimately exhaustive, but by a judicious combination of both principles better crops are obtained, both in quantity and quality.

Plants which are disposed to hybridity should be frequently renewed from the seeds of the wild plant; in general, the appearance of medicinal plants under cultivation, as far as my opportunities have extended, show a decided absence of hybrid species. This, I think, is produced by selecting for propagation those plants which are symmetrical in their physical and botanical development.

I have been informed that the parings of horses' hoofs is, or was, extensively used at Mitcham for lavender and peppermint crops, and although they certainly contain a considerable quantity of phosphate of lime and nitrogenized matter, it is difficult to understand their suitability as a manure, unless, from their slow and gradual decomposition, the soil is kept in a more uniform condition for a much longer time. I have not been able to determine the absolute value of this dressing for oil-yielding crops, but as far as its application for producing lavender flowers for "bunching," it seems eminently suited. The grower who used this to the greatest extent did not cultivate lavender for distillation.

It has been stated that henbane and foxglove lose their activity by drying, in consequence of a reduction of their active principle. This I am not able to support. I find that their active principles, as well as those of many other plants, are rendered less soluble, from a modified state of combination being produced.

By imperfect drying, fermentation might arise which might alter the remedial value of any preparation from these plants; but experiments are still wanting to prove that active principles are capable of conversion by direct fermentation, or decay, and toxicologists assure us that organized structures are not able to transform into other compounds the elements which form the molecule of an alkaloid.

Many growers have informed me that they are obliged to let their crops stand until the supply from foreign growers is ready for the markets; the result is, that in many cases the plants are allowed to remain some time after flowering before the officinal parts are collected; and since my experiments are so strongly opposed to such practice being allowed, it has suggested itself to me that a plan which might remedy this would be for pharmaceutists to insist that the plants should be supplied with their flowers, which would serve as a guarantee for the perfection of their condition.

It is much to be regretted that chemists, in determining the constituents of a plant, have overlooked the important relation which exists between the assimilative action of plants and the mineral constituents of the soil. In the case of plants supplied with highly nitrogenized manure, I have always found a much larger proportion of phosphates and nitrates, and variable proportions of soda salts; the latter can only be considered as arising from the manure. As such plants invariably yield a greater number of flowers, the analysis of the parts of the plant, if allowed to perfect its flowers, can only be complete when the proportions of its separate parts are only considered.

I met with a most singular illustration of how the mineral constituents of a plant may vary, in some foxglove plants, which, in order to facilitate my experiments, were transplanted in the early spring. These plants were taken from a wood near Wimbledon, with a portion of the soil for analysis. The soil consisted principally of decayed vegetable matter, and yielded on incineration about 9 per cent. ashes, of which 7 per cent. was soluble in water and dilute sulphuric acid, the remaining 2 per cent. consisted almost entirely of oxide of iron and silica. The complete analysis of these soils will be found in Appendix A.

The incineration of the leaves and stalks yielded about 4 per cent. ashes when taken from the soil referred to, and, after removal to a slightly manured soil, yielded nearly 10 per cent. ashes. The juice extracted from the leaves in July gave considerable quantities of phosphates, nitrates, and chlorides, with traces of sulphates. I analysed at the same time the juice ex-

tracted from the leaves of the plants growing on the original soil; it yielded larger proportions of chlorides and sulphates. The yield of ashes, on the incineration of the leaves and stalks, was about 6·3 per cent.

The analysis of the soil to which the plants were removed is given in Appendix B.

My experiments on belladonna, which have been confined to cultivated specimens, support the conclusion that very marked differences in the chemical composition of the soil gives rise in a corresponding degree to differences in the saline constituents of a plant, and that where the differences are but slight, no sensible difference is produced in the amount of mineral matter contained in the plant.

From the seeds of these plants I obtained :—Albumen, gum, inulin, phosphate of soda, nitrate of potash, chloride of potassium, sulphate of potash, an acid salt of atropia, malic and mucic acids, chlorophyll, and a peculiar principle,* similar to chlorophyll.

Hot water extracts a very large proportion of phosphates and sulphates, which are readily deposited in a crystalline form. At different seasons the organic salts are found to offer the greatest variation; many are detected only after the fall of the flower. I could not detect mucic acid in any part of the belladonna plants except the seeds. The presence of malic acid in stramonium seeds increases after the fall of the flower, but is

*This principle, I find, exists in the seeds of all plants on which I have operated; it differs from chlorophyll, first, in its solutions not becoming yellow on exposure to the air, and secondly, its insolubility in hydrochloric acid. It may be isolated by digesting the alcoholic extract in a mixture of hydrochloric acid and ether, and separating the supernatant solution, and allowing it to evaporate spontaneously. It then remains as a soft, oily substance, possessing the odor of the plant from which it is extracted.

M. Fremy has announced to the Academy of Sciences that he has found a substance in the leaves of plants which he regards as a modification of chlorophyll, and from its general properties I am inclined to think that it is identical with what I have found in the seeds and seed-vessels, but it certainly performs a different function here to that suggested by M. Fremy with regard to leaves.

also found in the juice extracted from the leaves. In nearly all cases the juices extracted from the seeds react much more strongly on litmus paper than the juices from the leaves or stalks, and it is a notorious fact that this acid reaction disappears by drying the plants.

The following is the percentage of active principles and salts obtained by my experiments from the following plants, grown under different conditions :—

Name and Condition of Plants.	Seeds.	Leaves.	Leaves, Stems, and Stalks.	Salts.
Belladonna (*Atropa Bellad.*) Highly manured.....	4·5 berries.	4·3	3·8	12·0
Same under ordinary cultivation.....	4·5 berries.	4·0	3·0	8·7
Foxglove (*Digitalis purpurea*). Wild....	9·2	9·0	8·0	10·0
Same, transplanted to a rich soil, manured slightly.....	10.1	8·6	8·0	14·0
Stramonium (*Datura Stramon.*) Self-sown from cultivat'd plants.	3·0 without pericarp.	2·9	2·0	2·9 seeds and seed-vessels.
Same, under cultivation.....	3·0 without pericarp.	2·0	2·5	3·9 seeds and seed-vessels.
Henbane (*Hyoscyamus niger*) Cultivated.....	4·0	3·6 before	3·0 flowering.	12·0 leaves and stems.
Hemlock (*Conium maculatum*) Wild.....	6·0	6·0	4·8	not determined.
Dulcamara (*Solanum Dulcam.*) Wild.....	7·2 Ripe	6·0 berries.	6·0	variable.

The effects produced by situation are of very great importance; a proper supply of air and moisture should form the first consideration for oil-yielding crops, and the soil best adapted should contain a proper proportion of silica, alumina, and lime, which seems to me can only be determined experimentally for each crop.

The finest specimens of chamomile flowers are obtained by carefully laying out the plants in rows, not nearer to each other, on any side, than two feet.* By allowing sufficient space, grow-

ers compensate for such plants which require a more exposed position than can be obtained in the general way of cultivation.

The tendency which some growers have of planting closely may explain the differences which have been observed in the medicinal effects of some plants, as foxglove and henbane. It is highly probable that growers have been stimulated to this practice by competitive impulse.

It is well known that plants which are secluded from light cannot perfect their seeds, nor effect the deoxidation of carbonic acid. As this results where the plants are situated closely to each other, especially if they have large leaves, it is highly probable that species may be produced. This may serve to explain the singular effect which I have already noticed in reference to henbane.

APPENDIX.

A. *Analysis of Soil from a Wood near Wimbledon.*

Chlorides, magnesium and potassium	2·1
Sulphate of lime	·3
Carbonate of lime	3·5
Carbonate of magnesia	1·1
Oxide of iron and silica	2·0
Water (lost at 212°)	12·0
Organic matter	73·0
Loss	6·0
	100·0

B. *Analysis of Soil;* vide *page* 213.

Phosphate of lime, with traces of magnesia	9·0
Chloride of potassium and sodium	4·6
Sulphate of lime	·5
Nitrate and phosphate of ammonia	·7
Silica	9·1
Oxide of iron	1·1
Organic matter	63·3
Water	8·0
Loss	3·7
	100·0

Analysis of Soil from Mitcham.

Crops raised: Lavender, etc. Yield of Oil per acre, 8 lb.

Carbonate and sulphate of lime	9·0
Carbonate of magnesia	3·8
Alumina	16·3
Silica	20.5
Oxide of iron	2·8
Phosphate of lime	6·0
Nitrate and phosphate of ammonia	3·0
Organic matter	23·7
Water (lost at 212° F.)	12·3
Loss	2·6
	100·0

Analysis of Soil.

Crops raised: Stramonium, Henbane, and Belladonna.

Phosphate of lime	4·5
Carbonate of lime	12·0
Alumina	18·0
Silica	10·0
Carbonate of magnesia	2·1
Oxide of iron	3·5
Chloride of sodium	2·5
Nitrate of ammonia	1·7
Water	20·1
Organic matter	24·0
Loss	1·6
	100·0

Analysis of Soil.

Natural Soil.—Solanum Dulcamara.

Sulphate of lime	2·0
Silica	36·0
Carbonate of lime	14·2
Alumina	9·5
Carbonate of magnesia	1·3
Oxide of iron	5·6
Water	12·4
Organic matter	15.0
Loss	4·0
	100·0

Analysis of Ashes.

Leaves and Stalks of Foxglove.

	Wild.	Transplanted.
Chloride of magnesium	18·0	4·0
Sulphate of lime	26·0	7·2
Phosphate of lime	·4	8.0
Chloride of potassium	16·0	0·9
Chloride of sodium		6·4
Silica and oxide of iron	33·6	64·0
Alumina	.9	9·5
Loss	5·1	
	100·0	100·0

Analysis of Soil.

Referred to in page 51.

Silica	48·0
Oxide of iron	7·2
Alumina	12·9
Sulphate of lime	1·5
Chlorides of potassium and sodium	1·9
Phosphate of lime	3·6
Organic matter	10·9
Water	9·0
Loss	5·0
	100·0

—*Proc. British Pharm. Conf., in Pharm. Jour., Oct.*, 1865.

DIFFUSION OF FLUIDS BY THE ATOMIZER FOR THE PURPOSE OF DEODORIZATION AND DISINFECTION.

Dr. Richardson explained to the members of the British Medical Association a process he had adopted for applying the atomizer for the purpose of deodorization. He made a mixture by adding iodine to a solution of peroxide of hydrogen until saturation occurred, and afterwards concentrated sea-salt in proportion of $2\frac{1}{2}$ per cent. In this combination a water was produced like sea-water, and which was rendered active by being charged with free iodine and ozone. The solution, placed in one of Krohne's hand atomizers, could be diffused in the finest state of distribution at the rate of two fluid ounces in a quarter

of an hour: but in an ordinary bed-room or sitting-room one ounce was sufficient to render the air so active that ozone test-papers were discolored by it to the highest degree of Moffatt's scale in from five to ten minutes. For charging the sick room rapidly and effectually with active air—in a word, with sea-air—Dr. Richardson said this plan was by far the most effective of any he had known. A nurse could put the apparatus into action at once, and could deodorize, hour by hour, according to the directions of the medical practitioner.—*Amer. Journ. Med. Sci.*, Oct., 1865, from *Med. Times and Gaz.*, Aug. 19, 1865.

BEE BREAD AS A DIURETIC.

Dr. Jas. S. Whitmire states (*The Chicago Medical Examiner*, September, 1865) that he has found the bee bread* to be a most powerful diuretic. He made the discovery accidentally. Having bought a quantity of honey in the comb, he feasted liberally on it with his family for four or five weeks, and noticed that his secretion of urine was largely increased. Fearing that his kidneys were diseased, he examined for albumen without finding any, and afterwards for sugar by the taste, when the taste of bee bread was detected, and its odor was also distinct. He then learned that his family was similarly affected.

To verify his suspicion as to the cause of his increased urinary secretion, he selected, he says, "some of the oldest comb that contained the greatest quantity of the bread, and separated it from the honey and comb; then, after abstaining a week from the use of my favorite sweet, and getting quite over my renal disease, as well as my unnecessary alarm, I partook of the bread, without the luxury of the honey, to the extent of ʒj three times per day, when, as I was expecting, back came the enormous secretion, but this time producing an entirely different effect upon my mind, so that I was now prepared to investigate the effects a little more at length. I continued taking ʒiij per day, for about a week, during which time I voided from four to six fluid pounds per day, the difference being the *greatest when I was at*

* The pollen of flowers collected by bees as food for their young.—Ed.

some out-door exercise. When I remained quiet, in my warm office, there was from one to one and a half pounds less secretion than when exercising. I also repeated the same experiment on my children, and found, to my entire satisfaction, that this article possesses most valuable diuretic powers, and there seemed to be no disagreeable symptoms following its use, excepting a slight degree of flatulency and a looseness of the bowels produced, the latter of which is not, unfrequently, very desirable, particularly in dysuria, where there is irritation of the neck of the bladder and urethra, or, even in strangury, where there is absolute inflammation of the urinary passages. This, to me, is the more evident, from the enormous quantity of urine secreted, and, consequently, any irritating quality that it might contain would be so diluted as to be rendered entirely mild and inoffensive to the delicate structure of the urinary passages.

"One advantage this article has over many others of its class is, that it is entirely palatable and inoffensive to the stomach, producing no irritation or nausea of the latter organ."—*Amer. Journ. Med. Sci.*, October, 1865.

ARMENIAN OR DIAMOND CEMENT.

This article, so much esteemed for uniting pieces of broken glass, for repairing precious stones, and for cementing them to watch-cases and other ornaments, is made by soaking isinglass in water until it becomes quite soft, and then mixing it with spirit in which a little gum mastic and ammoniacum have been dissolved. The jewellers of Turkey, who are mostly Armenians, have a singular method of ornamenting watch-cases, &c., with diamonds and other precious stones, by simply glueing or cementing them on. The stone is set in silver or gold, and the lower part of the metal made flat, or to correspond with the part to which it is to be fixed; it is then warmed gently, and has the glue applied, which is so very strong that the parts so cemented never separate. This glue, which will strongly unite bits of glass, and even polished steel, and may be applied to a variety of useful purposes, is thus made in Turkey:—Dissolve five or six bits of gum mastic, each the size of a large pea, in as much

spirits of wine as will suffice to render it liquid; and in another vessel dissolve as much isinglass, previously a little softened in water (though none of the water must be used), in French brandy or good rum, as will make a two-ounce phial of very strong glue, adding two small bits of gum albanum, or ammoniacum, which must be rubbed or ground till they are dissolved. Then mix the whole with a sufficient heat. Keep the glue in a phial closely stopped, and when it is used set the phial in boiling water. Some persons have sold a composition under the name of Armenian cement in England; but this composition is badly made; it is much too thin, and the quantity of mastic is much too small. The following are good proportions: Isinglass, soaked in water and dissolved in spirit, two ounces (thick); dissolve in this ten grains of very pale gum ammoniac (in tears), by rubbing them together; then add six large tears of gum mastic, dissolved in the least possible quantity of rectified spirits. Isinglass, dissolved in proof spirit, as above, three ounces; bottoms of mastic varnish (thick but clear), one and a half ounces; mix well. When carefully made, this cement resists moisture and dries colorless. As usually met with, it is not only of very bad quality, but sold at exhorbitant prices.—*Lond. Chem. News*, Nov. 3, 1865, from *Tinman's Manual and Sci. Amer.*

ON THE DETECTION OF METHYLIC ALCOHOL WHEN MIXED WITH RECTIFIED SPIRIT OF WINE, AND OF DISTINGUISHING BETWEEN ETHER AND SWEET SPIRIT OF NITRE WHEN PREPARED FROM PURE AND FROM METHYLATED SPIRIT RESPECTIVELY.

By Mr. W. Young.

Aware of the great interest taken at the present moment in the above subject, I thought a few remarks, on a method I have adopted for some time for detecting the presence of methylated spirit, might prove acceptable to your readers; especially as not much time or trouble are involved in its application.

The evidence of the presence of methylated spirit in, or having been used in the preparation of, the above articles, is based on the change produced by it in the color of the solution of permanganate of potash.

The solution I use, and which, in what follows, will be spoken of as "the test," is made by dissolving 1 grain of crystallized permanganate of potash in 1 fluidounce of distilled water.

Spirit of Wine.—1. If 10 minims of the test be added to 4 fluid drachms of the purest rectified spirit in a test tube, the mixture will be found to retain the bright pinkish color so characteristic of permanganate of potash, for at least ten minutes, when it gradually fades. As regards color, this may be taken as a standard for comparison.

2. Add 10 minims of the test to 4 fluid drachms of the same spirit, previously mixed with two per cent. of wood naphtha. The difference between this and the pure spirit is at once apparent. The liquid no longer retains its characteristic color, but almost instantly changes to a dull pale-brown tint.

3. Add 10 minims of the test to 4 fluid drachms of pure spirit, previously mixed with ten per cent. of wood naphtha, as in methylated spirit. Here the change in the color of the test is even more striking, the liquid at once assuming the brown tint, as in experiment 2, only in a greater degree.

So great is the delicacy of the test, that 1 part of wood spirit in 300 of rectified spirit of wine may be readily detected by its aid; but I imagine it will be most valued in the next application I shall speak of,—viz.: to sulphuric ether, as no ready method has been published for distinguishing the pure from that containing ten per cent. of oxide of methyl, prepared from methylated spirit. The pure ether, used in the following experiment, was Howard's make.

Sulphuric Ether.—Take two clean, dry test tubes, put 4 fluid drachms of pure ether into one, and the same quantity of methylated ether in the other; place side by side, and add to each 10 minims of the test, mixed immediately before use with 50 minims of pure rectified spirit, to render it more readily miscible with the ether. The pure ether will retain the pinkish hue, imparted to it by the test, for a considerable time; whilst that made from methylated spirit changes to a pale brown in a minute or so. By adding successive portions of the test, the same effects will be observed, as the oxide of methyl appears

to possess the property of decolorizing a considerable quantity of the test.

Sweet Spirit of Nitre.—Previous to applying the test to this spirit, either pure or methylated, I proceed in the way described by Mr. Tuck, on page 173 of the Pharmaceutical Journal for October; best described in his own words:—"Mix the sweet nitre with an equal bulk of solution of caustic potash, twice the strength of the Pharmacopœia solution, and, after allowing the mixture to stand about an hour, distill off an amount of spirit equal to the quantity employed."

On proceeding, as in the former experiments, a most marked difference will be perceived, on the addition of the test, between the pure and sweet nitre and the methylated, the former retaining, the latter soon losing its color.—*London Pharm. Journ.*, November, 1865.

THE SPONGE DIVERS OF CALYMNOS.

Some interesting details of the sponge trade of the Levant are given in Mr. Newton's recently-published narrative of his travels and discoveries. The island of Calymnos is celebrated for its sponge divers, who sail in a fleet of caiques for the coast of Asia Minor and Syria during the month of May, and fish up annually £16,000 worth of that valuable substance. The diver descends holding a flat stone in both hands to assist him in sinking, on which stone a cord is fastened. When he gets to the bottom he puts this flat stone under his arm, and walks about in search of sponges, putting them in a net hung round his neck as fast as he uproots them; he then pulls the cord as a signal, and is drawn up again. It is said that the best divers can descend to a depth of thirty fathoms, and that they can remain under water for as long a period as three minutes. From inquiries made by Mr. Newton, it does not appear that they are often cut off by sharks, though these monsters are not unfrequent in the southern part of the Archipelago. It is possible that the rapid descent of the diver may scare away this fish, who generally seizes his prey on the surface. A Calymniote told Mr. Newton that the most terrible sensation he had ever experienced

was finding himself close to an immense fish at the bottom of the sea. Under the root of the sponge is a parasitical substance of a caustic nature. This often bursts when the sponge is suspended round the diver's neck, and the liquid it contains causes deep ulcers in his flesh. Before exportation the sponges are cleansed and spread out in fields to dry. Acres of them may thus be seen exposed in fine weather. Sponges are sold by weight, and formerly the weight used to be increased by introducing a little sand. To prevent this fraud, the merchants insist upon their being filled with as much sand as they can hold, and as this amount can be accurately calculated, it is deducted from the gross weight.—*Lond. Chem. & Drug.*, Nov. 15, 1865.

PHARAOH'S SERPENTS.

To the Editor of the Pharmaceutical Journal:

Sir,—A very curious toy is now being sold in Paris, under the name of Pharaoh's Serpent. As this toy really constitutes an interesting chemical experiment, perhaps an account of it may prove interesting to your readers.

It consists of a little cone of tin-foil, containing a white powder, about an inch in height and resembling a pastille. This cone is to be lighted at its apex, when there immediately begins issuing from it a thick serpent-like coil, which continues twisting and increasing in length to an almost incredible extent. The quantity of matter thus produced is truly marvellous, especially as the coil which so exudes is solid and may be handled, although, of course, it is extremely light and somewhat fragile.

Having a little of the white powder, with which the cones are filled, placed at my disposal by a friend, I submitted it to analysis and found it to consist of sulphocyanide of mercury. This salt, when heated to a temperature below redness, undergoes decomposition, swelling or growing in size in a most remarkable manner, and producing a mixture of *mellon* (a compound of carbon and nitrogen) with a little sulphide of mercury. The resulting mass often assumes a most fantastic shape, and is sufficiently coherent to retain its form; it presents a yellow color on the ex-

terior, but is black within. The "serpent" shape of course results from the salt being burnt in a cone of tin-foil.

Both the mercurous and mercuric sulphocyanides decompose in the same manner; but the mercuric salt, containing more sulphocyanogen, seems capable of furnishing a larger quantity of mellon, and is the one used in the French serpents. A solution of pernitrate of mercury is readily precipitated by sulphocyanide of ammonium, and the mercuric sulphocyanide may be easily so prepared. It is best to use the mercurial solution as strong as possible, and to *keep it in excess* throughout the precipitation. Solution of perchloride of mercury is not so easily precipitated as the pernitrate, probably owing to the solubility of the mercuric sulphocyanide in the chlorides.

Perhaps I may be excused for adding that sulphocyanide of ammonium, suitable for the above purpose, may be very easily and economically prepared, as follows:—One volume of bisulphide of carbon, four volumes of liq. ammon. fort., and four volumes of methylated spirit are put into a large bottle, and the mixture frequently shaken. In the course of one or two hours the sulphide of carbon will have entirely dissolved in the ammoniacal liquid, forming a deep red solution. When this result is attained, the liquid is boiled until the red color disappears and is replaced by light yellow. The solution is then evaporated at a *very gentle heat* (about 80° or 90° F.) until it crystallizes, or just to dryness. The product is sulphocyanide of ammonium, sufficiently pure for the above purpose. One crystallization from alcohol will render it quite white.

One ounce of bisulphide of carbon yields, by this process, exactly one ounce of sulphocyanide of ammonium.

I am, etc.,

C. H. Wood, F C. S.

—*London Pharm. Journ., Oct.* 1, 1865.

MANUFACTURE OF ARSENIC ACID.

Girardin suspends powdered arsenious acid in water, and passes chlorine into the mixture, by which he soon obtains a clear solution of arsenic acid in hydrochloric acid. By evapo-

rating this solution, a mass of arsenic acid containing no trace of arsenious is procured. As it is difficult to keep any considerable amount of arsenious acid in suspension in water, the author finds it better to make a saturated solution of that acid in hydrochloric, and pass the chlorine into such solution while hot. The stream of chlorine is stopped when a little of the fluid neutralized with potash no longer gives a green precipitate with bichromate of potash, thus showing that all the arsenious acid has been converted. The hydrochloric acid may then be recovered by distillation, and the syrupy solution of arsenic acid left in the retort evaporated.—*Lond. Chem. News,* Oct. 13, 1865.

THE FLOWER FARMS OF FRANCE.

The growing of flowers for the production of fine essential oils and for medicinal purposes, is an important branch of horticultural industry in those departments of France bordering upon the Gulf of Lyons and the Mediterranean Sea, and especially in the southern portion of the Department of Var, adjoining the former Italian, but now French, province of Nice. There are extensive factories in Nismes, Montpellier, Morbihan, Nice, and some lately established across the sea in Algeria. Smaller establishments are found at Mentone, and all along the Genoese Riviera; but the great and acknowledged centre of this branch of industry is the town of Grasse, situated about seventy-five miles E.N.E. of Marseilles, a few miles inland, and its seaport Cannes, well known as the winter residence of Lord Brougham. It would be difficult to state, with any degree of accuracy, the product of the flower-fields of this interesting region. There are over sixty factories in Grasse, which is a flourishing place of 12,000 inhabitants, giving employment in the various departments of field and in-door labor, to fully 5,000 persons. Many manufacturers grow their own flowers, others buy them daily in the market, and still others are supplied by contract. The latter system prevails among the leading houses. Contracts are made, at a fixed price for a term of years, for the total product of a farm, at rates varying from 8 to 10 cents per kilogramme ($2\frac{1}{8}$ lb.) of rose leaves, up to 1 dollar for tuberose leaves, and even

higher for violet leaves; the latter being mainly produced at Nice. The average prices are about as follows:—Rose leaves 8 to 10 cents the kilogramme; jasmine leaves, 40 to 50 cents the kilogramme; orange leaves, 50 cents the kilogramme; acacia buds, 60 to 80 cents the kilogramme; tuberose leaves, 1 dollar the kilogramme; violet leaves, 80 cents to 1 dollar 30 cents the kilogramme.

These are the leading garden-flowers used in Grasse; only small quantities of the jonquil, narcissus, hyacinth, mignonette, etc., are produced. A great breadth of land is devoted to lavender, rosemary, thyme, sweet marjoram, cherry-laurel, sage, balm, and other medicinal and culinary plants, which are sold at much lower rates than the products of the above-named flowers.

The preparations derived from all these plants divide themselves into four classes:—essential oils, distilled waters, pomades and oils, and dried leaves and flowers. It is true that considerable quantities of extracts of the pomades are manufactured and sold, but they are generally of inferior quality, and will not compare with those produced by the great perfumers of Paris and this country.

The great bulk of essential oils produced consists of lavender, rosemary, thyme, sage, spike lavender, and sweet marjoram. The most valuable products, of any considerable amonnt, are the essential oils of Neroli and Petit Grain. The former is the result of the distillation of orange-flower water from the petals of the Bigarade or bitter orange (the sweet or Portugal orange yielding a somewhat inferior product,) and the latter is obtained from the green leaves of the same tree. The price of Neroli varies with the season from 30 dols. to 40 dols. the pound, of Petit Grain from 8 dols. to 12 dols. These two oils are used extensively in the composition of Cologne water, and in combination with bergamot and rosemary, give its distinctive character. The orange-flower water is consumed in immense quantities in France, in the "eau sucrée," so universally drunk in the hot seasons; this, by the way, is the only form in which a Frenchman will drink water at all.

The bigarade orange tree also furnishes a rough-skinned, bit-

ter, inedible fruit, from the rind of which is expressed an inferior oil called "essence bigarade," often used for adulterating the finer oils. The tree requires ten years to mature, and twenty to attain perfection, and yields an average of 17 lbs. of flowers per annum.

Rose-water is also distilled in large quantities. A result of its distillation is a very minute proportion of otto of roses of the very highest quality; it appears in small supernatant grains or drops, which are carefully skimmed off and rectified. It is superior to the famous Kizanlik or Turkish otto, and, like it, congeals at ordinary temperatures in beautiful, transparent crystals. I saw, at the celebrated manufactory of Mr. Antoine Chiris, who was in all things the leader of his profession, a bottle containing about three pounds, which he valued at 550 dols., or over 11 dols. the ounce. It is not an article of export, the quantity produced being very small, but is reserved for use in unfavorable seasons, or a failure of the flower crop, to give strength and finish to the pomades and oils. The "Rose de Mai" (*Rosa centifolia provincialis*), or double May rose, is the one universally grown.

Another very costly article, of which less than an ounce had been produced in Grasse at that time, is the essential oil of jasmine. Its existence in the flower was long and stoutly denied by the distillers, although they failed to prove what other principle caused its fine odor. In 1853, an Algerian chemist obtained a minute quantity, which cost him, we are informed, at the rate of 17,000 francs the kilogramme, or nearly $100 the ounce. It has, since then, been produced at a cheaper rate, but still too dear for commercial purposes. The wild Arabian jasmine is grafted on the cultivated plant of the same species, acclimated, and bears for many years, if not winter-killed, yielding from 90 to 150 lbs. of flower-petals per thousand plants. It is closely trimmed in spring and deeply covered in winter. The caterpillar is its most formidable enemy.

A most important branch, and one in which great rivalry exists, is the preparation of perfumed pomades and oils, which have a twofold use: first as bases for the finer kinds of hair oils and pomatums, and next as a medium for obtaining spirituous extracts for

the handkerchief and the toilet; such as Lubin's well-known "Extraits pour le mouchoir." Their preparation is the most curious and interesting feature of the Grasse establishments.

The pomade "body," which is prepared in winter, is composed of one part of beef-suet and two parts of beef-lard (except for jasmine and tuberose, which is mainly lard, hardened by mutton or veal suet), thoroughly hashed, washed in several waters, and, among the best manufacturers, washed several times in rose water to deprive it of all unpleasant odor, then carefully melted and stored away in huge tin cans, in airy, cool vaults, for use in the season of flowers. Another preparation, called "corps dur," or hard body, is made of beef-tallow only, and is used in the manufacture of stick pomatums. For the oils, the inodorous virgin olive oil is used, expressed from olives just before their maturity.

The busy operations of the year commence with the rose season.

There are two processes for impregnating the pomade body and the oils with the floral odors—one by infusion and maceration, the other by what is termed "enfleurage." The first is employed for the strong, less volatile odors of the rose, orange, and acacia; the latter for the sensitive, ethereal perfumes of the jasmine, tuberose, jonquil, and all the bulbous plants, which will not endure the application of even a moderate degree of heat.

And, first, by infusion. About 100 kilogrammes (220 lbs.) are put into a tin planished copper vessel, placed in a copper water-bath, melted at a low temperature, and charged, at daybreak, with a certain quantity of the freshly-gathered flowers, which are stirred constantly during the day or night, the mass being kept only warm enough to maintain a semi-fluid state. About midnight it is removed from the fire, poured into strong bags, made of fish cord, and subjected to heavy pressure in large perforated iron cylinders, standing vertically upon marble bed plates, which are gently warmed, to prevent the congelation of the exuding mass. Next morning fresh leaves are added, and the process repeated daily, until the desired strength of perfume is attained; the pomade is then poured into cylindrical tin boxes, and sealed up for shipment.

The oils are treated in the same manner as to maceration, but are filtered instead of being pressed.

The process of "enfleurage" is as follows:—Large numbers of "châssis, or sashes, are prepared, about 2½ feet long by 1½ wide, the frame itself being 2 inches wide and 1½ thick, holding a stout plate of ground glass, and resembling in construction a large school slate. Those for the oils are about 4 by 2½ feet, proportionately heavy, and, in place of the glass, have coarse iron-wire network. The large factories have several thousands of each of these frames.

Upon each side of the glass the pomade is thinly spread, and the surface is channeled or furrowed with a four-tinned square-pointed wooden fork, so as to present the utmost surface for the absorption of the odor from the flower-leaves, which are thickly sprinkled upon it. The frames are successively charged with flowers, and piled one upon another, up to the ceiling. The leaves, confined between two strata of pomatum, wither, and yield up their odorate principle, which is rapidly absorbed. Daily renewals of the flowers are made, until the proper strength is obtained. The perfume pomade is then scraped off gently, melted into a water-bath, and poured into cans.

In preparing the oils, coarse, heavy, spongy, cotton cloths, made especially for this purpose at Marseilles, are saturated with olive oil, and spread upon the netted frames; flowers are then strewed thickly upon them, and they are piled up in like manner as the pomade frames. When sufficiently charged with the odor, the oil is expressed from the cloths by powerful levers.

Many hundred-weights of flowers and herbs are dried annually, are variously used in medicine, in cookery, and in the composition of scent-bags, cachous, fumigating-pastilles for the sick chamber, and kindred compounds of the perfumer's art.

The Parmesan or double violet is grown mainly at Nice, under the shade of trees, and yields a delicate and delightful perfume. It was the favorite odor of the Athenians under Pericles, and is now one of the most fashionable scents of the Parisian *beau monde*.

The flower-farms receive the highest culture. Under-draining was not practised at the period of my visit, but great attention

was paid to irrigation. In some fields at Cannes there were complete networks of irrigating-tubes, substantially laid in cement. A constant warfare is waged upon insects, and each plant has its particular borer, grub, or bug. Continual vigilance is the price of success.

The heat in summer is intense, though tempered by the sea-breeze; and the winter is, at times, as rigorous as at Washington or Richmond.

Male labor costs 35 to 40 cents per day, and female 15 cents. —*Lond. Pharm. Journ. Nov.* 1, 1865, from *American Gardener's Monthly.*

THE CROP OF OIL OF PEPPERMINT IN MICHIGAN.

By Frederick Stearns.

Referring to a paper on the culture and production of oil of peppermint presented to the Association a few years since, I beg now to offer the following statistics in regard to the annual crops for the four years of the rebellion.

The figures refer only to St. Joseph's County, the small quantity produced in a few other counties, on isolated plantations, not tending to increase them materially:

The crop for 1861, ...	15,000 lbs.
" " 1862, ...	18,000 lbs.
" " 1863, ...	24,000 lbs.
" " 1864, ...	11,000 lbs.

Average value per pound, 1861, . .	$2.25.
" " " " 1862, . .	2.75.
" " " " 1863, . .	3.00.
" " " " 1864, . .	5.00.

1861, '2, and '3, were favorable years for its growth, and the enhanced price led to a greater production; while 1864 was more unfavorable; the drouth affected it, and there was not so much mint set on account of the scarcity of laborers.

Mint farmers, who would grow from 30 to 60 acres, now grow 5 to 10, though there are occasional large growers.

The quality of the oil averages about the same as indicated in the former paper; if any change, it is for the better.

The crop for 1865 promises to be still smaller than for 1864. Much of the mint was winter-killed; there was less new mint set than usual, and a worm has made its appearance which destroys it.

The growth of corn and other great staple products yielding more profit, afford indication that the growth of acres of mint is gradually, year by year, becoming less.

I have not obtained the average number of acres under mint growth for the four years named, otherwise the *pro rata* value could be given; but while the crop of 1863 was a large yield at a fair price, the crop for 1864 was less than half, at far greater cost for labor, and was spread over almost as much land.

New lands in St. Joseph's County have nearly doubled in value in five years. Labor that was plenty at $15 per month previous to the rebellion, is now scarce at $30.

The best of the oil of peppermint of Michigan finds it way into market through the Messrs. Hotchkiss, under their brand; the balance is sold in the New York market, through the commission merchants and brokers.

Detroit, Sep. 1*st*, 1865.

—*Amer. Pharm. Assoc.*, 1865.

NATIVE WINE FROM THE GARDEN RHUBARB PLANT.

By Frederick Stearns.

An enterprising gentlemen, of Belvidere, Illinois, Mr. J. R. Mudge, having introduced into market, during the last four or five years, a new native wine, made from the garden rhubarb, I offer the following in regard to its culture and manufacture, as obtained from him.

The growth of the plant for wine making was commenced in 1858, from what is termed the "strawberry variety," and has been continued ever since with continually increasing crop. The first crop was 1500 gallons, from that to 4000 gallons in 1864, while this season's crop is over 10,000 gallons.

When mature, the plant being cut, the juice is expressed, just as corn juice is obtained, and an equal bulk of water being added, with seven pounds of sugar to each gallon, is passed through

two vinous fermentations. When three years old it is fit for market. Its alcoholic strength varies from seven (7) to ten (10) per cent., according to its age.

Its flavor is pleasantly vinous, sweet, and similar to foreign sherry. Its peculiar medical value lies in an aperient property, aside from its alcoholic tonic power, a gentle movement of the bowels usually following its free use.

It is marketed by Mr. Mudge in glass, and in 10, 20, and 40 gallon casks. Value, $3 per gallon.

Detroit, Sept. 1, 1865.

—*Amer. Pharm. Assoc.*, 1865.

ON ESCHWEGE'S PATENT WOOD NAPHTHA, AND ITS USES IN THE ARTS AND MANUFACTURES.

By Mr. John Tuck.

In a paper published in the "Pharmaceutical Journal" for January, 1863, I drew the attention of pharmaceutists to what was at that time a new and remarkable spirit patented in this country, and known as "Patent Pure Wood Spirit," or "Patent Pure Wood Naphtha," samples of which were shown at the late International Exhibition.

This spirit was as odorless as ordinary spirit of wine, and as free from any disagreeable taste. It was, in fact, so totally unlike the ordinary wood-spirit or naphtha of commerce, that I felt it to be my duty to ascertain positively that it was one of the many products of the destructive distillation of wood, before making any extended trials of its solvent powers on various bodies. I should, perhaps, here state that naphtha or wood spirit can, when not mixed with fermented spirit, be readily detected by means of oxalic acid, the naphtha being converted into crystals of the oxalate of oxide of methyl, solid at all ordinary temperatures, whilst fermented spirit is by the same treatment only converted into a liquid, heavier than and a little soluble in water. On submitting this new spirit to the action of oxalic acid, the formation of these crystals of methyl-oxalic ether thoroughly proved it to be wood spirit with which I had to deal.

This patent wood naphtha is obtained from the commercial

article by largely diluting it with water, filtering the diluted spirit through large cylinders of granulated charcoal, and then distilling, some portions of the first and last runnings being rejected. It is finally rectified, and sent into commerce as a nearly absolute spirit.

Since the publication of my former paper, I have made many trials, on a larger scale, of the pure wood spirit, and find its solvent powers to be remarkably similar to fermented spirit, so that it will become of very great importance in those arts and manufactures requiring spirituous menstruums, free from any disagreeable smell, and capable of dissolving the gums, resins, oils, alkaloids, etc., etc., used in their various processes. Ordinary crude naphtha was formerly almost always used in the making of French polish, and for dissolving the lac used in stiffening the basis of silk hats, and in the manufacture of spirit varnishes generally. The great reason for naphtha being so extensively used, and its disgusting odor and injurious effects on the eyes and body generally being submitted to, was on account of the enormous price of fermented spirit, the only other solvent that was at all available—the price of naphtha at this time being about nine shillings, and fermented spirit, nineteen shillings the gallon. In many cases, this high price of fermented spirit operated very injuriously upon the British manufacturers, especially in cases where the lower-priced naphtha could not be used on account of its abominable odor. This evil became, at length, so great, that, as is well known, the Legislature wisely permitted methylated spirit, or spirit of wine, duty-free, to be used, it being, however, first mixed with ten per cent. of ordinary naphtha, in order to render it unfit for use as a beverage, and thus prevent injury to the revenue.

Although this was a very wise and liberal measure, and a great boon to many arts and manufactures, still there are others to which it is of no service whatever. The odor of ten per cent. of ordinary naphtha is, and even if it were only one per cent., would be quite sufficient to effectually shut it out from being used in perfumery, in making the various flavoring essences, and the finer kinds of spirit varnishes. Piesse says, in his "Art of Perfumery," speaking of transparent hard soap,—"Until the

Legislature allows spirit to be used free of duty for manufacturing purposes, we cannot compete with our neighbors in this article; the methylated spirit has such an abominable odor that it cannot be used for making scented soaps for the toilet." It would, indeed, be a great boon to pharmaceutists, as well as perfumers, and I heartily wish that some plan could be devised, whereby a spirit of wine, without disagreeable odor or injurious admixture, might be allowed duty free for their respective uses. I feel convinced, too, that the Board of Inland Revenue would be in favor of such a measure for a duty-free spirit, if we could first prove to them that the revenue would not be injured thereby, and in this lies the difficulty.

Pharmaceutists require a duty-free spirit, without disagreeable odor or any admixture which would prove injurious, when the mixed spirit was taken internally, in quantities of at least half an ounce.

Perfumers and others require a duty-free and odorless spirit, but it is not absolutely essential for it to be free from injurious admixture when taken internally.

The Board of Inland Revenue, on the other hand, will only sanction a spirit of wine being duty free, conditionally upon something being added to it, so as to render it totally unfit for the purposes of a beverage. Another condition is, that such addition to the spirit shall be a permanent mixture, and not removable by any known process, method, or operation.

Now, I think it will be plain to all, that these conditions, as regards pharmacy at least, are extremely difficult of realization, if not impossible, so that I fear we must still continue to use a duty-paid spirit. Although it may not, perhaps, ultimately be an extremely difficult task to not only find a method of rendering fermented spirit thoroughly unpotable, but incapable of being made so, and at the same time adapted for fine varnishes and perfumery, it nevertheless is not at all probable at present.

It is in meeting these hitherto unsupplied requirements of perfumery, varnish-making, etc., etc., (none of which were benefited in the least by methylated spirit,) that the patent wood naphtha has become of so much importance, all the essential oils, odorous substances, resins, gums, etc., being as soluble in it, and in some

cases even more so than in spirit of wine. In my former paper I gave a list of more than twenty essential oils I had dissolved in it; since then I have tried its solvent action on many other essential oils and substances used in perfumery, and the general conclusion I have come to concerning it is, that it is a most valuable menstruum, and one well worthy the attention of perfumers and others requiring a spirit for its solvent action. I have made several compound perfumes, using only the patent wood naphtha as a solvent,—amongst them have been lavender water, verbena, eau de Cologne, the "favorite," etc.; and I have pleasure in placing samples of the perfumes so prepared before the Conference, and some specimens illustrating the purification of the crude naphtha,—No. 1, being the mixture of oily hydrocarbons obtained by diluting the naphtha with water, and found floating on the surface of the diluted spirit; No. 2, obtained by distilling the charcoal used in the purification of the diluted spirit; No. 3, the finished patent wood naphtha, as sent into commerce.

For making transparent soaps, as far as my experiments permit me to give an opinion, it will be found to answer in every respect as well as fermented spirit—curd, Castile, and other soaps being just as soluble in it. It will be in the recollection of some here present, that a few years ago ordinary wood-naphtha was given and recommended extensively in the treatment of phthisis, and now that it can be obtained free from odor and disagreeable taste, its medicinal action upon the system would form a very interesting inquiry. In cases of painful inflammation, headache, etc., etc., the "Patent Wood-spirit" makes a far better evaporating lotion than spirit of wine in the same proportions, on account of its greater volatility, its boiling-point being much lower. To the naturalist it affords a new and valuable agent for the preservation of his animal and vegetable specimens, being free from the faults that attend the ordinary naphtha. It also promises to be of the highest importance in photography; from some experiments detailed lately in one of the photographic journals, gun-cotton is more soluble in it than in sulphuric ether, and I have seen a good picture taken upon collodion so prepared. The patent wood-naphtha collodion will prove a great boon to photographers in India and warm

climates, where the ordinary collodion frequently boils as it is poured on the plate. In conclusion, I have made no satisfactory experiments upon the physiological effects of the patent wood-spirit nor the ethers prepared from it upon the human system. I think there is a large field here open for the investigations of the physician, for undoubtedly some of them will prove to be most powerful agents in the treatment of diseases.

Wilton, near Salisbury, August 21, 1865.

Mr. Tuck said that, since his paper was written, the authorities had stopped the manufacture of Eschwege's patent wood naphtha, but it was to be hoped that perhaps, under certain regulations, its production would be continued.

This was also the general opinion of the meeting.—*British Pharm. Confer.* in *Lond. Pharm. Jour.*, *Oct.* 1, 1865.

ON A METHOD OF DRYING GLUTINOUS SUBSTANCES.

A large number of substances, like gum, &c., have, as is well known, the property of conglomerating, upon drying, into amorphous masses, more or less solid and translucent, by which, on the one hand, the original appearance of the freshly-made preparation is lost, and, on the other, complete dessication rendered very difficult. In order to obviate this adhesion of the elementary particles occurring during the drying of such substances under ordinary circumstances, Reischauer has proposed to carry on this operation out of contact with the atmosphere, and by the aid of a suitable ethereal medium. The apparatus employed for this purpose is, in its simplest form, a well-closed glass vessel filled with ether or a similar liquid, at the bottom of which is placed the chloride of calcium, quicklime, calcined sulphate of copper, &c., intended to absorb the water. A shallow vessel is placed below the surface of the liquid for the reception of the substance to be dried. The *modus operandi* is now a very simple one. The ether continually yielding its water to the chloride of calcium, constantly withdraws it in turn from the substance to be dried,

until, finally, the latter corresponds in its hygroscopic state with that of the desiccating agent. The thorough wetting in this manner, of the constituent particles of the substance to be dried, which of course must be those insoluble in an ethereal liquid, prevents their sticking together, and the original appearance is retained when dry.

Gum separated by precipitating the aqueous solution with alcohol, gives an amorphous white mass of very slight adhesiveness, and with no trace of the common glass-like condition. The so-called diastase, or the body obtained by precipitating the extract of malt with alcohol, deprived of water under ether, forms spongy and very light granules. In this state it retains its effect upon starch. The microscopical examination of starch paste dried by this process leaves scarcely a doubt that the starch grains exist in paste in a state only of extraordinary expansion, and not in that of actual solution. Hops give a mass similar to diastase, but, however, no longer capable of producing fermentation.

The organs of plants dry rapidly under this treatment, commonly retaining their color, unless unusually delicate. Taken from the ether, they soon become moist again in the air, and rapidly lose their color, which, by a continuance in the liquid, appears remarkably fine.

The behaviour of animal productions under this method of drying is of especial interest. It may be remarked that, generally, while vegetable matters are distinguished by their great brittleness in the dry state, those of animal origin are characterized by a remarkable toughness, which reaches its highest degree in the fibrous formations of the skin. The pliability of thick skin dried in ether over chloride of calcium is very extraordinary. Other animal preparations at the same time preserve their original form in the dry state, the usual contraction of the parts being thus avoided. The whole intestines of a young dog, treated in this manner, formed a remarkable anatomical preparation, in which the delicate structures were preserved in the most complete manner upon drying. The lungs and liver, to preserve which vain attempts have hitherto been made, formed a light spongy mass, retaining completely

their organization. It is more than probable that anatomists can make use of this process in many cases; as, for instance, in the microscopical examination of the kidneys, pancreas, &c., and particularly in those which have hitherto required the solidification of the object by chromic acid, &c. The use of the ether in a liquid form is frequently not necessary. The skin of animals, animal membrane, &c., readily assume, in an atmosphere saturated with the vapor of ether, containing a suitable, strongly hygroscopic substance, a condition similar to that of white dressed leather. A like satisfactory result, however, is not obtained in the desiccation of inorganic substances, oxide of iron, alumina, &c., in artificial media.

It is obvious that this process may be rendered useful, under suitable modifications, for other purposes. It is a ready method, according to Reischauer, for removing acid bodies soluble in ether from their aqueous solutions, by putting them into an ethereal liquid with caustic lime or potassa.—*Zeits. Anal. Chimie* from *Dingl. Polyt. Journ.*

REMARKS ON EXTRACTS OF MEAT.

By Henry B. Brady, F. L. S., etc.

(This was a short verbal communication, of which the following is as full a report as can be furnished.)

The author stated that he should not have ventured to occupy the time of the Conference, already over-crowded with business, still less would he have intruded on the regular order of written papers, but for the concluding remarks in the President's address, and the desire which had been expressed by several members that he should open the subject for discussion at that sitting.

There were several forms in which the soluble extractive of meat had been used, either for general dietetic purposes, or for the convenience of the sick-room: the most important were those obtained from beef, and he would confine his remarks to them. Firstly, there were the fluid preparations represented by Gillon's "essence of beef;" secondly, those of gelatinous consistence, of which excellent examples were largely sold by one

or two London manufacturers, to which class also belonged the so-called "osmazôme glacée;" thirdly, the more permanent soft extractive, free from gelatine, known as "extractum carnis, Liebig;" and fourthly, a somewhat similar article, thickened with starchy matter, and evaporated further, so as to form lozenges or tablets. On each of these, he would say a few words:—

Gillon's "essence of beef" was, he believed, exactly what the makers professed, a carefully prepared beef-juice, having many advantages over anything that had preceded it for use in the sick-room. There were, however, drawbacks in connection with it; it was insipid, variable in strength, contained a good deal of gelatine, and did not always agree with invalids; still, it was a convenient and valuable basis for beef-tea, and it was fortunate that, with the present uncertain supply of other meat-extracts, there was anything so reliable to be obtained, even at a somewhat advanced price.

Of the gelatinous preparations, he had only seen the "concentrated beef-teas," prepared by Messrs. Fortnum and Mason and Messrs. Brand & Co. These were supplied of the consistence of firm jelly, done up in skins, each weighing half a pound to a pound. They appeared to be, essentially, extracts of beef containing the gelatine, and, when fresh, answered well for the preparation of beef-tea. The great objection to them was the difficulty of keeping them; in a damp place, the bladders moulded on the outside; in a dry place, the jelly lost water, and after a time became quite hard, and about the texture of glue, in which condition it was dissolved with great difficulty. The price, too, was against their general introduction. Recently, a material of somewhat similar character had been largely imported into France, from Rio Grande, under the name of "osmazôme glacée," of which he regretted that he had not yet been able to procure a sample, but it appeared from all accounts to have the worst qualities of this somewhat objectionable form of extract.

The third substance in order, the so-called "extractum carnis," of Liebig, might be said to have been introduced to the notice of the public in this country by a paper in the "Popular Science Review" for April, 1865, and, within a short time, the

article itself was offered for sale in London, in small quantities, at a high price. Its recent commercial history was probably known, by dire experience, to all present—its very excellence seemed to be the likeliest cause of its failure in a commercial point of view. The demand had been excessive; the supply, hitherto, had been very limited. The process employed in its manufacture had been suggested some years ago by Baron Liebig, though it had, until recently, only been carried out on a comparatively small scale. In the Royal Pharmacy, at Munich, it was still prepared to a considerable extent, under the direction of Professor Pettenkofer, and, indeed, they had a ready sale for all they could make at the somewhat high price of a florin and twelve kreutzers (a little over two shillings) per ounce. The process as settled by Liebig and Pettenkofer had been adopted in the Bavarian Pharmacopœia, and was closely followed in the laboratory at Munich. It was pretty much as follows, speaking from memory:—

Five pounds of fresh beef, cut very small and deprived of bone, tendon, and fat, were digested at 212° (in a steam pan) for an hour in ten pounds of water, and the liquor separated by strong pressure; the residue again digested in a similar way with the same quantity of water, and again subjected to pressure. The mixed liquids were evaporated to about three pounds weight, and allowed to cool; after standing, the fatty matter was skimmed off, and the evaporation continued until an extract of ordinary consistence was obtained. Ten pounds of meat should yield six ounces of extract. A specimen of extract so prepared, given him by Professor Pettenkofer during a recent visit to Munich, was on the table, and it would be found to possess, in a high degree, the qualities sought in such a preparation. The process originally devised, which depended only on heat and strong pressure for the exhaustion of the meat, had been found wasteful in practice, and had been discontinued in favor of the use of water, as in the formula given.

The large numbers of wild or semi-wild cattle slaughtered in South America for the sake of their hides and fat, suggested an obvious source for the cheap production of such an extract, and though long neglected, the matter had been recently taken up

by Herr Giebert, a German civil engineer, resident in Uruguay. This gentleman, after consulting Baron Liebig, and receiving personal instruction in the mode of preparation from Professor Pettenkofer, had established works on a considerable scale in Uruguay, from which all the extract which had come to this country had been derived. The specimens were excellent, though, it must be confessed, not quite equal in point of flavor and consistence to that prepared at Munich, but there seemed no reason why it should not become so after longer experience in its manufacture. The difference between the two was chiefly attributable to faults in its preparation, which were by degrees being remedied. The *nature* of the extract obtained from the flesh of semi-wild cattle did not differ from that obtained from domesticated oxen; it was, however, singular that the *proportion* of extractive matter to flesh was greater in the latter than in the former. Thus, the flesh of wild cattle yielded about three per cent. of extract; that of domesticated oxen about three and eight-tenths per cent., or about one-fourth larger quantity.

He should say very little on the purely chemical portion of the subject; for, though he had made a considerable number of experiments, hoping to determine some of the chemical questions which arose, he had been compelled to leave them in a half-finished condition. The extract was soluble in boiling water, about one-half soluble in alcohol, and partially soluble in cold water. It appeared to contain creatine, potash, lime, and magnesia, with phosphoric and lactic acids. The insoluble residue, after treating with cold water, appeared to be chiefly creatine and phosphate of magnesia. When examined under the microscope, the extract showed large crystals of creatine and phosphates. One very singular point in connection with it was the enormous number of bubbles of gaseous matter held in suspension; even heating the extract of the boiling-point seemed to make but little difference in this respect. Whether these were attributable to air mechanically diffused through it by the constant stirring during its evaporation, or whether they were the results of some slow decomposition (nitrogen or carbonic acid), he was not able to say, but he was inclined to the latter belief.

In respect to its nutritive properties, it had been disputed

that the *Extractum Carnis* was equal to the amount of beef which it was supposed to represent, *i. e.*, to thirty times its own weight. For a person in full health, the fibrous portion of the flesh was probably required as plastic material, or, at any rate, as a diluent for the extractive matter; but the case was far different with invalids; and, probably, no food which had been proposed was of equal value in preventing the waste of the tissues during illness. Professor Pettenkofer had spoken of the extraordinary effects of a mixture of a strong solution of the extract, with wine, as a restorative after severe accidents, and of the striking statistics obtained by himself and Baron Liebig in the convalescent wards of the Royal Military Hospital at Munich, which seemed to indicate that, under the free use of the extract, the period of convalescence was reduced to one-third of the duration common under the old regimen. The mere quantity of phosphates and chlorides contained in the extract, upon which so much stress had been laid by some, was not enough to account for these facts. That the extractive matter was the most important nutritive portion of flesh was also shown by the circumstance that dogs fed upon the exhausted fibrine rapidly starved.

If the *Extractum Carnis* could be procured in quantity, it seemed likely to be of incalculable value as an addition to the somewhat limited dietary of sea-going vessels on long voyages. In salted meats, the potash salts were replaced by the chloride of sodium, and to this cause the prevalence of scorbutic diseases was, with fair reason, assigned; but this preparation would supply the deficiency, and thereby conduce to the health of the seamen.

The author trusted that, at no very distant time, the present uncertainty in the supply might be obviated by the manufacture being carried on in many other parts of the globe where there was large trade in hides. Our own great colony of Australia ought not to be behindhand in the matter; and when it was known that the comparatively valueless flesh of wild or semi-wild cattle might be turned by a simple process into a remunerative article of commerce, the supply must surely keep pace with the demand.

Allusion was lastly made to the "Extract of Beef Lozenges," made by Messrs. Gillon & Co. They appeared to be the fluid essence of beef, made by the same firm, evaporated down, and sufficient starch or flour added to render them of suitable consistence for cutting into tablets. The addition of starchy material was requisite, as the continued evaporation could not be carried on without danger of decomposition, and the extract was, to some extent, hygroscopic, unless mixed with drying matter. Like the fluid preparation, the lozenges contained a good deal of gelatine, and a gluey smell and flavor was evolved on evaporating a solution of them. They could scarcely be considered of much practical importance, though their sustaining virtues had been exalted by some Alpine Club men, who had used them in long mountain journeys.—*Proc. Brit. Pharm. Conf.* in *Lond. Pharm. Journ.*, *Oct.* 1, 1865.

[NOTE.—*Borden's Extract of Beef.*—The importance of reliable information in reference to the extracts of various kinds representing beef, whether liquid or solid, is so apparent, that we re-publish the remarks of Mr. Brady with satisfaction, as giving a good general view of the several forms used in Europe. It should be recollected, however, that Mr. Gail Borden, one of the pioneers if not *the* pioneer in popularizing this species of diet, produced his "meat biscuit" as early as 1849, and obtained for it a Council medal in 1851, awarded by the judges at the great International Exhibition at London. Since that time Mr. Borden has, in various ways, occupied himself in the same direction, as, for instance, in the preparation of Borden's Preserved Milk, now widely known. Latterly he has gone extensively into the business of preparing a solid extract of beef, analogous to Liebig's "Extractum Carnis," but with the albumen retained, the evaporation of the meat juices being conducted in vacuo at a low temperature, on the plan of making the "preserved milk." No salt or condiment is added, so that the extract represents twenty times its weight of fresh beef of prime quality. To secure the latter quality in the raw material Mr. Borden has established his works in the prairie country of Illinois, where cattle can be obtained cheaper than in our Eastern pastures, and of unexceptionable quality. In fact, experiment has convinced Mr. Borden that the juices of beef raised in that region, and not subjected to the depletion consequent upon being driven to an eastern market, are richer in extract than such Eastern beef as would be available for this purpose. We have tried this extract ourself, prepared for use according to directions accompanying, which simply require boiling water, salt and condiment to taste, and have been favorably impressed with its qualities. As

first obtained it is elastic like rubber, of a reddish brown color, and with a slight, rather inviting odor. It hardens by exposure, loses its elasticity, and is covered by a very slight whitish efflorescence without any indications of being hygroscopic. The temperature at which the process of extraction is carried on, prevents the coagulation of the albumen, which is therefore retained in the extract along with the organic and mineral salts proper to flesh juice, and which swells the aggregate yield practically to about 5 per cent., a desideratum not found in the "Extractum Carnis," (see page 83). We have noticed none of the gluey odor, alluded to by Mr. Brady, in Borden's extract. But little if any gelatine is present in this extract, as in some of those used under the name of portable soup, and which swell the quantity of extract representing a given weight of animal food very considerably. Mr. John Currie, of New York, well known as a chemist, is associated with Mr. Borden in this enterprise, and contributes his practical knowledge in favor of a careful conduction of the manufacture. We hope our physicians will give this extract a careful trial in the numerous cases where dietetic aid of this kind is so important in the recuperative process after the wasting effects of disease, and we doubt not, so long as it is prepared in the careful manner and on the correct principles of the present process, from sound beef, that it will give ample satisfaction.

The form in which we have seen Borden's Extract of Beef, is in rectangular masses, three by one and a half inches and half an inch thick, weighing two ounces and representing two pounds and a half of fresh beef. Directions for use by the sick, and for the table, accompany the packages.—Ed. Am. Journ. Pharm.]

ON THE NUTRITIVE VALUE OF "EXTRACTUM CARNIS."

By Justus Liebig.

I see that rather contradictory views are expressed by different English writers on the value of the Extract of Meat, some taking it to be a complete and compendious substitute for meat, whilst others assert that it has no nutritive value whatever. The truth, as is usually the case, lies in the middle; and, as I was the first who entered more fully into the chemistry of meat, I may be allowed shortly to state the results of my investigations, as far as the Extractum Carnis as a nutriment is concerned.

Meat, as it comes from the butcher, contains two different series of compounds. The first consist of the so-called *albuminous* principles (*i. e.*, fibrin and albumen) and of glue-forming membranes. Of these, fibrin and albumen have a high nutritive value, although not if taken by themselves. The second series consists of crystallizable substances—viz., creatin, creatinin,

sarcin, which are exclusively to be found in meat; further, of non-crystallizable organic principles and of salts (phosphate and chloride of potassium). All of these together are called the *extractives of meat.* To this second series of substances beef-tea owes its flavor and efficacy; the same being the case with Extractum Carnis, which is, in fact, nothing but solid beef-tea—that is, beef-tea from which the water has been evaporated. Besides the substances already mentioned, meat contains, as a non-essential constituent, a varying amount of fat. Now, *neither fibrin nor albumen* is to be found in the Extractum Carnis which bears my name; and gelatine (glue) and fat are purposely excluded from it. In the preparation of the extract, the albuminous principles are left in the residue. This residue, by the separation of all soluble principles, which are taken up in the extract, loses its nutritive power, and cannot be made an article of trade in any palatable form. Were it possible to furnish the market at a reasonable price with a preparation of meat, combining in itself the albuminous together with the extractive principles, such a preparation would have to be preferred to the Extractum Carnis, for it would contain *all* the nutritive constituents of meat. But there is, I think, no prospect of this being realized. Happily, the albuminous principles wanting in the extract of meat can be replaced by identical ones derived from the vegetable kingdom *at a much lower price.* Just the reverse is the case in regard to the *extractive* matters of meat, for (their salts excepted) it is impossible to find any substitute for them. On the other hand, they may be extracted from the meat and brought into the market in a palatable and durable form. In conjunction with albuminous principles of vegetable origin, they have the full nutritive effect of meat. From the extractive matters, then, contained in Extractum Carnis in a concentrated form, the latter derives its value as a nutriment for the nations of Europe, provided it can be produced in large quantities, and at a cheap rate, from countries where meat has no value.

The albuminous principles of vegetable origin are principally to be found in the seeds of cereals, and the European markets are sufficiently provided with them. On the other hand, the

supply of fresh meat is insufficient, and this will get worse as the population increases. For an army, for example, it will not be difficult to provide and store up the necessary amount of grain or flour. Sugar, too, as well as fatty substances and the like, will be procurable, their transport and preservation offering scarcely any difficulty. But there may easily occur a deficiency of fresh meat. Salted meat but inadequately replaces fresh meat, because, in the process of salting, a large quantity of the extractive principles of the meat are lost; besides, it is well known that those who live on salt meat for a continuance become subject to different diseases. Dried meat generally means tainted meat scarcely eatable. Extractum Carnis, combined with vegetable albumen, enable us to make up the deficiency, and that combination is the only one at our disposal. What was said of an army also holds good of those European nations in general that do not produce a sufficiency of meat. By making the most of the herds of South America and Australia, in using them for the preparation of Extractum Carnis, and by the importation of corn from the West of United States and other corn-growing countries, the deficiency may be made up, although not to the full extent. For, supposing ten manufactories, producing together ten millions of pounds of extract of meat from a million oxen or ten millions of sheep, that whole quantity would provide the population of Great Britain only with *one pound yearly* for every *three persons*—that is, *one* pound a day for every 1100 persons.

I have before stated, that, in preparing the extract of meat, the albuminous principles remain in the residue; they are lost for the nutrition, and this certainly is a great disadvantage. It may, however, be foreseen that industrial ingenuity will take hold of this problem and solve it, perhaps by a circuitous road. For if this residue, together with the bones of the slaughtered beasts, be applied to our fields as manure, the farmer will be enabled to produce a corresponding quantity of albuminous principles, and to better supply our towns with them, either in the shape of corn or of meat and milk. Made into a marketable state, it may hereafter replace the Peruvian guano, which very soon will disappear from the market.

On the value of extract of meat, as a medicinal substance, it is unnecessary to say a word, it being identical with beef-tea, about the usefulness and efficacy of which opinions do not differ. At the same time, I may remark that it is a mistake to think that beef-tea contains any albumen—that there ought to be any gelatine or drops of fat to swim on its surface. Beef-tea does not contain any albumen, and, if rightly prepared, ought to be free from gelatin (or glue), whilst the supernatant drops of fat form a non-essential and, for many, an unwelcome addition.

I should be glad if these lines could assist in clearing up public opinion on the value of extract of meat as a nutriment; my aim being, on the one hand, to reduce to their right limit hopes too sanguine; on the other, to point out the true share which the extract of meat can have in the nutrition of the people of Europe. In doing this, I know full well that whatever may be said for its recommendation would be in vain, if the extract of meat did not supply a public and generally-felt necessity, and if it could not stand the test of our natural instinct—a judge not to be bribed.—*Lond. Pharm. Journ., Dec.* 1, 1865, from *The Lancet.*

ALUMINA AS AN INGREDIENT OF SOAPS.

Soaps intended for toilet use ought not to contain any free alkali, seeing that free alkali exercises a corrosive action upon the skin. Soaps, however, which are perfectly neutral, containing no alkali which is not combined with the stearic or other fatty acid employed, are not nearly such powerful detergents as soaps containing an excess of alkali—are not nearly so capable of dissolving the substances which it is the office of soap, when applied to the body, to remove from the skin. Singular to say, M. Bonnamy, a manufacturing chemist resident at Saint-Germain, has found that if that very neutral substance, pure alumina, be added to completely neutral soap, the soap becomes even more powerfully detersive than the most highly alkaline soap, while remaining entirely free from corrosive properties. The alumina may be introduced into the soap in various ways, the most advantageous perhaps being the use, in the process of manufacturing the soap, of an alkaline salt of alumina, as alu-

minate of potash or soda, instead of free alkali. An equally good result is, however, obtained by mixing free alumina, in dry powder, with melted soap which has been manufactured in the ordinary way. M. Bonnamy proposes to use alumina, also, in various cosmetics, and especially in cold cream, and he moreover regards it as affording an admirable base for tooth-powders, by reason of its complete neutrality, and the ease with which it can be tinted by means of perfectly innocent coloring matters.—*Scientific American.*

ANILINE AS A TEST FOR THE ADULTERATION OF LINEN BY COTTON.

A method of using aniline as a means of ascertaining whether or not the linen in any fabric is mixed with cotton, and, if so, in what proportion, is given by Bottger in a recent number of the "Chemisches Central Blatt." At the corners of one end of a strip of the fabric to be tested he loosens the threads so as to expose both the warp and the woof. He then dips that end of the strip in an alcoholic solution of aniline red, washes it in water until the washings are colorless, and then places it in an aqueous solution of ammonia. If any cotton is present, the ammonia will discharge the color from it without touching the color of the linen portion. The linen threads will remain of a bright rose color, but the cotton threads will become quite white.—*Scientific American.*

Varieties.

On the Oxidation of Fatty Vegetable Oils.—In a memoir presented by M. Cloëz to the French Academy of Sciences, he treats of the influence of light and heat on oxidation. The author's results are of much interest. He exposed oils to the air in colorless glass vessels, and also in vessels of red, yellow, green, and blue glass, and also left some oil exposed to air in total darkness. After ten days exposure, the increase of weight was greatest in the colorless glass vessel; it was rather less in the blue glass; was very small in the red, yellow, and green; and no increase of weight at all was observed in the oil exposed in the dark. Like results were found after twenty days; but after thirty days exposure, the results were

somewhat different. The increase of weight was greater in the colored glasses than in the uncolored, green showing the largest increase, after 150 days exposure. It is worthy of notice that poppy oil, after a time, oxidized faster in the dark than when exposed to colored or white light. Oil, heated in atmospheric air, oxidized much more rapidly than cold oil. The oxidation may be accelerated without heat by adding some oil already oxidized.—*Am. Drug. Circ.*

A Mountain of Saltpetre.—Dr. Harrison, the original discoverer of the gold, silver, copper, and lead mines of the Crystal Peak mining district, located near where the Henness Pass road first strikes the Sierra, in coming this way from Virginia City, has recently added to his other discoveries a "mountain of saltpetre." This mountain is said to exist about six miles north-east of Crystal Peak, and it is claimed that there is no mistake as to either the genuineness or quantity of the article. If it occurs in such quantities as described, its location must soon render it of great commercial value.—*Am. Drug. Circ.*, from *San Francisco Mining Press.*

Bismuth.—This metal has of late years risen considerably in price. Amongst other causes, some journals have stated that, two or three years ago, a company was formed to work an invention by which gold was to be made by the transmutation of bismuth into that metal, and that large quantities of the former metal had been bought up for this purpose. Whether such an enterprise was or was not entered upon does not appear. The following is a list of the prices:—

	s.	d.		s.	d.	
1844	0	10	to	2	0	per pound.
1845	2	0	"	4	0	"
1846	4	0	"	3	3	"
1847	3	3	"	2	6	"
1848	2	6	"	2	0	"
1849	2	0	"	2	6	"
1850–7	2	6	"	——		"
1858	2	6	"	3	6	"
1859	3	6	"	4	6	"
1860	4	6	"	6	6	"
1861	6	6	"	9	6	"
1862	9	6	"	20	0	"
	11	0	"	——		"
1863	11	0	"	10	6	"
1864	10	6	"	11	0	"
1865	10	6	"	11	0	"

Up to 1844, a large quantity of bismuth was produced in this country from cobalt ores in the old way of refining; but a new way of treating

such ores, then introduced, necessitated the loss of much of the bismuth, and, since that time, we have been chiefly supplied from the Saxon and Bohemian mines. In 1845, there was a large demand for a composition to make rollers for calico printers, raising the price for a few months. In 1858, the supply began to fall off, and in 1861–2, there was a very large extra demand for medicinal preparations, which, to a certain extent, still continues, but the demand for mechanical use has, since that time, been very trifling. New sources of supply are opening, and prices, it is said on good authority, are likely to fall.—*Am. Drug. Circ.*, from *Journal of the Society of Arts.*

To Keep Eggs.—M. Bournouf recommends in *Le Belier*, a French journal of commerce, the following method of preserving eggs:—Dissolve in two-thirds of warm olive oil one-third of beeswax, and cover each egg completely with a thin layer of this pomade with the end of the finger. The eggshell, by degrees, absorbs the oil, and each of its pores becomes filled with the wax, which hermetically seals them. M. Bournouf affirms that he has eaten eggs kept two years in this manner, in a place not exposed to too great extremes of temperature. He thinks also the germ may in this manner be preserved for a considerable time.—*Am. Drug. Circ.*

Editorial Department.

Poisonous Calomel.—The following item, cut from the Missouri Republican of Nov. 19, 1865, has been sent to us for notice. We are so accustomed to rely upon the purity of calomel as made by Powers & Weightman, and other responsible houses, that it rarely happens that calomel is put to the test. Hence the damage done in the instance above. The manufacturer must have been very careless to have passed such "calomel" into the market for consumption, without subjecting it to the usual test of ammonia added to the washings. The question may be asked how did this calomel pass the Drug Inspector at New York or other point? probably on the faith of the label, which is that of an old House. This occurrence points to the importance of apothecaries themselves looking to the real character of the drugs and chemicals they dispense as the safest and surest means of protecting the community from such catastrophes.

"*Foreign Medicines.*—Not long agowe reported a circumstance occurring in Randolph County, Ill., which resulted in the death of several persons from the administration of English calomel bought in our city. One of our chemists, becoming interested in the matter, obtained samples from all the St. Louis druggists for the purpose of examining them. The English calomel is generally imported in one pound bottles, sealed, and a label pasted over the mouth, so that it cannot be opened without it being noticed. Druggists sell the article as they receive it, and it may pass through many hands before it reaches the practitioner who dispenses

it, and who is the only person able to judge of the contents after leaving the factory in England. If, therefore, any such bottle contains a substance different from what the label calls for, the fault rests with the manufacturer.

The samples received by our chemist were from the well known firms of MANDER, WEAVER & MANDER, of Wolverhampton, and ATKINSON & BIGGAR, of London. It was the label of the former of these which was on the drug dispensed in Chester, as was the case also in a town on the Missouri river where persons were poisoned, but saved by the timely administration of the antidote. The external appearance of the samples was that of good calomel, but in the instance of that sold at Chester and at the Missouri town referred to, the substance was found to be contaminated with corrosive sublimate to the extent of 12.75 per cent. There was no trace of the poison in the other samples, bearing the label of the same firm, but one of three bottles from ATKINSON & BIGGAR contained corrosive sublimate, while no trace of poison could be found in calomel of American manufacture.

If our physicians still persist in using English calomel in preference to American, manufactured by responsible parties whose interest and reputation would be at stake were they to commit such fatal blunders as above related, they ought to be careful to examine every bottle before they use it, for they never can be sure which bottle will contain the dangerous admixture. The easiest method to detect the presence of corrosive sublimate in calomel is the following: Stir a small quantity of the calomel with cold distilled water for a few minutes, filter and add to the filtrate a little of a very dilute solution of iodide of potassium; the presence of corrosive sublimate will be shown immediately by a bright red precipitate; the liquid filtered from pure calomel will not be changed.—*Missouri Republican, St. Louis, Nov.* 19, 1865.

SUNDAY CLOSING IN BOSTON.—Our Boston confreres have arrived at the same conclusion that we have; that necessity knows no law, and when men get sick and need aid they don't stop to inquire what day of the week it is, but send to the apothecary and expect to be served with medicine. An acute cholic or an attack of neuralgia will, for the time, rapidly dispel sectarian prejudices from patients of all sects.

Massachusetts College of Pharmacy.—At a special meeting of the Board of Trustees, held Oct. 1st, a committee was chosen to confer with the State Constable in regard to his late order closing the apothecaries' stores on Sunday. The committee attended to their duty, and at the regular meeting of the board, Nov. 1st, made a report of their doings, which was accepted, and ordered to be placed on file; after which the following resolutions were offered and adopted:—

Resolved, That we believe the observance of the Sabbath as a day of rest from labor to be a Divine institution, appointed by God for the good of man; that it is alike binding upon us by the laws of God, the laws of man and the good of society; that for these reasons it is both our duty and inclination to observe it strictly, so far as is practicable to the necessities of society as at present organized.

Resolved, That by reason of the necessity for dispensing of medicines, and the furnishing of many other articles, to those whose necessities absolutely require them of us on the Sabbath, we have been obliged to conform to the custom of keeping our stores open at all times, as well Sundays as in the night, to be ready to dispense these articles of necessity.

Resolved, That by reason of our stores being so opened for the convenience of those whose wants are imperative, a custom has grown up in the community of calling upon the apothecaries for many articles not of prime necessity which could be as well obtained the day before or the day after the Sabbath; that although we do not labor as upon other days, yet the mere selling of those articles has caused a portion of the public to regard us in the light of Sabbath-breakers, classed with barbers, restaurant keepers and bar tenders, that the most conscientious observers of law, order and propriety do not hesitate to call upon us, in violation of the Sabbath and the laws of the Commonwealth, to furnish them with medicinal liquors, stationery, mineral waters, palliative confections, dietetics, cosmetics, and many other articles, all of which, in many cases, are of prime necessity *at the time*, and which would be a violation of the laws of charity and mercy to deny upon the Sabbath.

Resolved, That in view of the difficulty of defining what are and what are not articles of charity and necessity, without inquiring too particularly into the motives of others; the mortification we experience in denying our customers and friends what seems to them a reasonable request; the expense of keeping the store provided with the same talent, heat, light and other conveniences as upon other days; the dubious position we hold in the eyes of our best and most conscientious citizens, *until they* wish to be accommodated; the deprivations of the benefits and the blessings of the Sabbath to ourselves and assistants; all render it more to our profit and advantage to close our places of business on the Sabbath.

Resolved, That in view of all these facts, we are unable to draw any line for the guidance of apothecaries, and powerless to recommend any articles or class of articles that may or may not be sold legally on the Sabbath. Therefore, we can only recommend to each apothecary to judge for himself of each particular case, and dispense all articles of necessity agreeable to his best judgment, according to the language and intent of the law.

A. P. Melzar, *Secretary*.

Insects injurious to Vegetation.—The attention of our readers is called to the following communication, which is extracted from Silliman's Journal for November, and with the spirit of which we entirely coincide:—

Entomological Society of Philadelphia.—The publication committee of this Society propose to publish, and issue gratuitously, an occasional bulletin, under the title of "The Practical Entomologist," in which papers on the insects injurious and beneficial to vegetation will be given for the benefit of the American farming interest. They express in their circular (dated September, 1865,) the hope that the information imparted through this medium will be of use to the agriculturists of the country, by leading them to study critically the Entomological fauna which surrounds them, and to derive, from their knowledge thus acquired, the power to increase the production of their crops and develop the interest which they represent. It is a singular fact that some of our commonest and most injurious insects are least known. Our Cotton, Hop, and various other crops suffer at times immensely from insects whose habits we little understand. The Society aims by its publication to bring out the true history of each and all of our noxious insects; and it is believed that, this attained, simple remedies will suggest themselves, which in certain cases may be merely burning the stubble and vigorous fall ploughing.

They ask, in order that their plan may be carried out, that those having information will send it by letter to the Secretary of the institution, at No. 518 South Thirteenth Street, Philadelphia, along with alcoholic phials containing specimens of the noxious insects of the region. They also de-

sire papers from scientific observers for the "Practical Entomologist," as only the active coöperation of all interested parties will insure success in an undertaking which is a labor of public benefit, without moneyed recompense.

Progress of Agassiz.—It may be interesting to our readers to hear from this intrepid naturalist, which we are able to do by the following extract from the Philadelphia Medical and Surgical Journal for Dec 16:

Letters have been received from Prof. Agassiz, giving an account of his scientific explorations in and along the river Amazon. Dr. Continto of Brazil, a gentleman of large scientific acquirements, who has already made a thorough exploration of the Amazon, accompanies Prof. Agassiz. He writes as follows, under date of August 22:

"The Professor does not cease extolling the riches of this region, and is completely absorbed by his darling fishes. We collected in Grupá and Tagipurú ten new species, and likewise a new species of alligator, named Jacaréky. He told me to-day that when the work was concluded, we will make a real revolution in the scientific world. Almost sixty new species in less than fourteen days! It is really a revolution.

"The great preparations that the Professor made for his collections are far within what nature furnishes him, such is the prodigality of life in the valley of the Amazonas. All is superabundant, and there is a luxuriance of products so extraordinary that it exceeds the most extravagant dreams that the man of science formed when he prepared for his voyage."

Prof. Agassiz himself writes as follows, under date of August 20th:

"The result of our inquiries, above all, respecting fish, goes beyond the most extravagant dreams I ever had. Not only do I know that all the locations we visit nourish different faunas, but I foresee also that the intermediate localities will furnish still new and distinct species, so great are the differences of those we have already studied.

"I had in view to solve the problem of the geographical distribution of the fishes, by making four or five separate collections between Pará and Manáos, but now I know not what limits we should preserve, so that it is best to multiply the collections as far as circumstances will permit."

In another letter of the same date he says:

"It is equally interesting to discover the manner of inter-association of the species; it is evident, for example, that the fishes assembled at Pará are not the same as those united at Manáos, or in the great affluents of the Amazonas. I have already a certainty of this from the collection I made at Pará. During the eight days spent in your hospitable city, where so many courtesies and such delicate attentions were showered on me, I collected sixty-three species of fishes—of this number nearly a dozen unknown; and, notwithstanding, about forty-five species are already described as peculiar to the Amazon. Consequently those that are known which I did not discover at Pará must dwell in some other region of the great river. You see now that the work merely of two days tends to demonstrate that each region of this great basin must have collections of different species, a fact that science was completely ignorant of until now.

"Besides, if the species of different regions differ one from the other in the same river, and if marine fishes ascend the river in a limited number to an inconsiderable distance from the sea, shortly it will become improbable that the fluvial species can proceed from the marine species; above all, if the different shoals are found in similar regions of the river and at a short distance from one another.

"Well, you see what results this ought to give in time; and in the meantime I can only indicate the track that I count on following in my

researches. All I can as yet say to you is, that of the sixty-three species found at Pará not less than forty-nine are inedited, which will require the establishment of eighteen new genera to give them place in the system of fishes. Besides this, I perceive the necessity of distinguishing five families that have been confounded with others to the present time."

Under date of September 8th, Prof. Agassiz writes that he had then obtained more than three hundred species of fish, although he had, to that time, only examined one-third of the Amazon, without trenching on its affluents. He had only counted on, at most, two hundred and fifty or three hundred species, and he says that not a third of those he collected belong to known ones.

The latest report is that Agassiz was to leave Manáos, in Amazonas, on the 10th of September, for Tabatinga, in Peru.

Pharaoh's Serpents—No more remarkable instance of the influence of public curiosity on the production of chemicals can probably be adduced than in the case of the so-called Serpent's Eggs, where sulphocyanide of mercury, an almost unknown salt, is suddenly produced in large quantities to gratify a curiosity, partly real and partly the effect of a name; for, had not an acute suggestion connected the idea of burning this salt in a particular way, so as to give its voluminous ash a serpentine or vermicular form, with the magic art of Pharaoh's wise men, it is not probable that so remarkable a demand would have been made on the chemical caterers.

In another column, page 61, we give Mr. Wood's paper, which gave the first notice to the English and American journals. The sulphocyanide of mercury, like calomel, is insoluble in water, and needs some glutinous excipient to form it into pastilles, but, as this addition detracts from the combustibility of the salt, the art of making them consists in giving them the right degree of firmness without invading this property.

Several accidents have occurred from the ignition of quantities of the salt, and one factory, at least, has been destroyed. We have not yet heard of any destruction of life by the pastilles, but, as they are made from a mercuric salt, it is not impossible that, like white precipitate, subsulphate, and other insoluble persalts of mercury, they are poisonous. The products of combustion, however, appear to be harmless—a fortunate circumstance.

To Our Subscribers.—An apology is due for the delay in issuing this number, which has arisen from causes partly editorial, but chiefly chargeable to the printer.

The Internal Revenue Laws in Relation to Pharmacy.—The special commissioners appointed to investigate the working of the Internal Revenue laws in general, and more especially in relation to alcohol and alcoholic liquors, coffee, tobacco, etc., etc., have been industriously engaged in gathering testimony and other evidence. The committee appointed by the American Pharmaceutical Association at the last meeting, of which Dr. E. R. Squibb is chairman, have obtained a hearing, and have earnestly represented the views of the Association in

reference to the sale of liquors, the stamp tax on proprietary articles, and especially in reference to the reduction of the tax on alcohol, as being greatly conducive to the interests of pharmaceutical and chemical manufacturing; and as probably, by giving less inducement for illicit distillation, and greater consumption in the arts, causing an equal, if not greater, revenue. What the final influence of the commission will effect on Congressional action, we cannot yet know; but we know that, on the main points, considerable harmony of opinion existed between the principal commissioner, and three members of the committee who consulted with him in regard to the more important changes needed.

The Richmond Medical Journal. E. S. Gaillard, M. D., and W. S. McChesney, M. D., Editors and Publishers. January, 1866, Vol. I., No. 1. Richmond, Va., 1866.

The first number of this journal has reached us just as we are going to print. It is announced by the Editors as a monthly octavo of eighty pages; and the Editors have made arrangements which, they think, will give it a standing among first class journals of medical science. We wish it and them success, and cheerfully put it on our exchange list.

OBITUARIES.

John T. Plummer M. D., died on the 10th of April, 1865, at Richmond, Indiana, at the age of 58 years, after much suffering from cardial disease, growing out of frequent severe attacks of acute rheumatism, Dr. Plummer was born in Montgomery County, Maryland, in 1807, though his parents were residents of Baltimore. In 1816 he was placed at Nine-Partner's Boarding School, in New York, where he remained four years. In 1819 his father removed to the west and settled finally in Richmond, Indiana, where the subject of this notice passed the larger portion of his life.

"His boyhood was characterized by great devotion to books, and a remarkable absence of the love of, or indulgence in youthful sports and pastimes," and, according to his own statement, prior to nineteen years, he was avaricious of knowledge and pursued it with intense earnestness. He had a great aptitude for language, and, later in life, acquired a critical knowledge of the English, and studied French, German, Latin, Greek and Hebrew, and was the personal friend and correspondent of Noah Webster.

"Dr. Plummer's scientific acquirements were general and profound," but especially in the direction of natural history and chemistry. He studied medicine with Dr. Thomas Griffith, of Richmond, and graduated in the medical department of Yale College in 1828, at the close of his 21st year, soon after which he commenced practice in Richmond, Indiana, and continued it to the close of his life, a period of 37 years. Of all his studies Chemistry and Pharmacy were his favorites, and the pages of this Journal testify to his ability and thoroughness in chemical pursuits. These essays will be found in the 22d, 24th, 25th, 27th and 28th volumes, whilst his

last communication was in the 31st volume, July, 1859. These essays relate to the acid of the tomato, the fat of capsicum, the action of chromic acid on volatile oils, the coloring principle of red sandal wood, to various pharmaceutical preparations, to the sale of poisons, to the action of ozone on the volatile oils, etc.

Dr. Plummer was a consistent and influential member of the Society of Friends, and in his progress through life was governed by the conscientious convictions of a thinking mind as to his duties, religious, professional and social. He was so strongly opposed to show or ostentation as regarded his acquirements as in this to be almost eccentric, and declined several proffered professorships in medical schools, where he might have given a useful vent to his large accumulations of knowledge in the medical sciences.

Prof. Lindley.—The death of Dr. John Lindley, the distinguished Professor of Botany in University College, was announced on the 3d inst. Dr. Lindley was born on the 5th of February, 1799, at Catton, near Norwich, where his father was proprietor of a large nursery garden. After leaving the Grammar School of Norwich, he devoted his attention to botanical science. In 1819, he published a translation of *Richard's Analyse du Fruit*, and in 1820 a work entitled *Monographia Rosarum*, in which he described several new species of roses. About the same period he contributed to the *Transactions of the Linnæn Society* various papers on botanical subjects. Some time afterwards he proceeded to London, where he became Assistant Secretary to the Horticultural Society, and was engaged by Mr. Loudon to write the descriptive portion of his *Encyclopædia of Plants*, the merit of which, as a botanical work, was entirely due to him, as was stated in the preface. The *Encyclopædia* was completed in 1829. In the same year he was appointed Professor of Botany at the London University. At this period the Linnæn system was almost universally followed by English botanists. It is one of the chief merits of Dr. Lindley that he early saw the necessity of superseding the artificial by the natural classification of plants. In an essay on this subject, published in his *Introduction to the Natural System of Botany*, published in 1830, he showed very clearly what the advantages of this system were, and thus paved the way for its general adoption in England. Two years later he published the *Introduction to Systematic and Physiological Botany, and a Synopsis of the British Flora*, in which our indigenous plants were arranged and described for the first time according to the natural system. In a *Natural System of Botany*, published in 1836, Dr. Lindley took new views of botanical classification, and proposed a new nomenclature for the families of plants. Ten years later, his great work, *The Vegetable Kingdom*, was published. This work, the most elaborate that had appeared on systematic botany, gave a description of all the families of plants, and more especially of those useful to man. It gave very extended lists of the genera, and was generally recognized as one of the most important contributions which had at that time appeared on systematic botany. While engaged in writing these works, Dr. Lindley was most diligently employed, as a practical botanist, in describing new species, on which he wrote a large number of papers contributed to botanical publications. In 1841, he became editor of the *Gardeners' Chronicle*, a weekly publication, which he conducted with great ability. In 1860, he was appointed examiner in the University of London. He was a Ph. D. of Munich, and a Fellow of the Royal Society, of which, in 1858, he received the medal as a reward for his services to botanical science.—*Chemist and Druggist.*

Catalogue of the Class of the Philadelphia College of Pharmacy,

FOR THE FORTY-FIFTH SESSION, 1865-66.

With a List of their Preceptors and Localities.

MATRICULANTS.	TOWN OR COUNTY.	STATE.	PRECEPTOR.
Allaire, C. B.	Aurora,	Illinois,	Roe Brothers.
Allen, Wm. E.	Philadelphia,	Pennsylvania,	Charles Ellis, Son & Co.
Barnitz, F. M.	York,	"	W. B. Webb.
Bartram, Ernest,	Philadelphia,	"	T. S. Wiegand.
Blair, Henry C.	"	"	Andrew Blair.
Blizzard, J. E.	"	"	John Stradley.
Bolster, J. W.	"	"	Bullock & Crenshaw.
Booth, George K.	Marietta,	Ohio,	Lancaster & Wills.
Booth, Joseph R.	"	Ohio,	W. H. Hickman.
Borhek, James T., Jr.	Bethlehem,	Pennsylvania,	M. M. Selfridge.
Boring, Edwin M.		"	E. B. Garrigues.
Bowman, Henry K.	Philadelphia,	"	B. F. Johnson.
Braddock, Isaac A.	Haddonfield,	New Jersey,	C. Ellis, Son & Co.
Brooks, G. W		Mary'and,	A. R. Hortter.
Brown, Samuel A.	Philadelphia,	Pennsylvania,	J. R. Angney, M. D.
Buckman, James,	Bristol,	"	D. L. Stackhouse.
Burk, Wm. B.	Philadelphia,	"	J. M. Higgins, M. D.
Cahill, Michael,	Dublin,	Ireland,	Ruly & Evans.
Campbell, Hugh,	Philadelphia,	Pennsylvania,	Jno. W. Simes, Jr.
Carberry, P. J. L.	"	"	Jno. Gegan, M. D.
Cary, Edward R.	Zanesville,	Ohio,	H. G. O. Carey.
Chance, Henry C.	Philadelphia,	Pennsylvania,	Samuel Gerhard.
Coblentz, John C.	London,	Ohio,	J. P. Coblents.
Craven, James C.	Philadelphia,	Pennsylvania,	Bullock & Crenshaw.
Croft, S. F.	Chambersburg,	"	Frederick Brown, Jr.
Cuthbert, Richard W.	Athensville,	"	O. S. Hubbell.
Day, Robert L.	Somerville,	New Jersey,	Thomas R. Coombe.
Dilks, Samuel L	Philadelphia,	Pennsylvania,	Saml. L. Dilks.
Dobbins, Albert N.	Mt. Holly,	New Jersey,	J. P. Thatcher.
Dobson, C. L.	Bucks Co.,	Pennsylvania,	James L. Bispham.
Drescher, Augustus,		New York,	Louis Koch.
Elliot, Frederick D.	Philadelphia,	Pennsylvania,	Wetherill & Bro.
Erwin, Bertine S.		"	Charles Ellis, Son & Co.
Esterle, August A.	Philadelphia,	"	Royer & Royal.
Evans, J. Estell,	May's Landing,	New Jersey,	French, Richards & Co.
Ferguson, David S.	Philadelphia,	Pennsylvania,	J. B. Ferguson.
Ford, S. Alfred,	"	"	Polytechnic College.
Fry, W. R.	Crawfordsville,	Indiana,	R. K. Krout.
German, Wm. D.	Philadelphia,	Pennsylvania,	Wetherill & Bro.
Haig, Charles R.	"	"	Henry A. Bower.
Hambright, Edwin A.	Mount Holly,	New Jersey,	Wm. Procter, Jr.
Hamrick, Adam Henry,	Philadelphia,	Pennsylvania,	John H. Bunn.
Hand, Alfred,	"	"	
Harding, Henry,	"	"	C. H. Fish.
Harner, James M.	Reading,	"	Martin & Bernheimer.
Harper, John B.	Philadelphia,	"	T. Morris Perot & Co.
Harry, Jacob,		Maryland,	Hassard & Co.
Heymann, H.	Philadelphia,	Pennsylvania,	Wm. T. Taylor M. D.
Hillary, Wm. B.	"	"	Wm. Hillary.
Himmelwright, F. E.	"	"	George C. Bower.
Hoffman, John V.	Baltimore,	Maryland,	Wm. McIntyre.
Horn, David, Jr.	Philadelphia,	Pennsylvania,	Beates & Miller.
Isard, George W.	"	"	Wright & Siddall.
Johnson, James P.	Washington Co.,	"	
Jones, Edward B.	Medford,	New Jersey,	Thomas J. Husband.
Kay, Samuel D.	Haddonfield,	"	Alfred B. Taylor.
Klump, Charles C,	Allentown,	Pennsylvania,	Klump & Weber.
Kneesnaw, Wm. W.	Trenton.	New Jersey,	Hassard & Co.
Krider, Lewis,	Philadelphia,	Pennsylvania,	Wm. Ellis & Co.
Kurtz, Augustus, M.	Chester,	"	J. W. Flickwir.

Laird, Wm. R.	Reading,	Pennsylvania,	Alfred B. Taylor.
Lane, Benjamin, H.	Philadelphia,	"	Wm. F. Simes.
Lessey, Oliver H.	"	"	Bullock & Crenshaw.
Levering, P. Wharton,	Roxborough,	"	O. S. Hubbell.
Lippincott, Robert C.	Philadelphia,	"	R. Shoemaker & Co.
Little, A. H.	"	"	Bullock & Crenshaw.
Locuson, Joseph S.	"	"	Isaac K. Kay.
Lowber, Alexander,		Delaware,	Benjamin Caulk.
McMinn, Joseph H.	Williamsport,	Pennsylvania,	James T. Shinn.
McPike, W. C.	Alton,	Illinois,	Wm. A. Holton & Co.
Marshall, Robert T.	Philadelphia,	Pennsylvania,	Wm. F. Simes.
Merkel, L. J.	Cleveland,	Ohio,	F. Brown, Jr.
Millemann, Philip,	Chicago,	Illinois,	B. L. Smedley.
Milliac, John,	Philadelphia,	Pennsylvania,	Wm. F. Patterson.
Missinger, Levin A.	Easton,	"	C. H. Needles.
Moore, Charles C.	Philadelphia,	"	Bullock & Crenshaw.
Moore, O. L.		Wisconsin,	J. W. Robbins.
Morris, Charles G.	Indianapolis,	Indiana,	Browning & Sloan.
Moseley, A.	Philadelphia,	Pennsylvania,	J. Wyeth & Bro.
Newbold, Thomas M.	"	"	French, Richards & Co.
Newton, John S.	"	"	Alfred W. Newton.
Nordell, P. Augustus,	Rock Island,	Illinois,	Daniel Hershey, M. D.
Ottinger, Franklin,	Philadelphia,	Pennsylvania,	James N. Marks.
Painter, Emlen,	Delaware Co.,	"	Charles Shivers.
Parrish, Clemmons,	Philadelphia,	"	Edward Parrish.
Pawling, Isaac D.	West Chester,	"	Benjamin Foster.
Pile Gustavus,	Philadelphia,	"	Wilson H. Pile, M. D.
Plank, W. S.	Churchtown,	"	Joseph S. Plank.
Rambo, Milton,	Chester,	"	M. H. Bickley.
Rau, Robert,	Bethlehem,	"	S. Rau.
Remington, Jos. P.	Philadelphia,	"	C. Ellis, Son & Co.
Rewalt, John W.	Middletown,	"	Wm. Taylor.
Rice, Wm. C., Jr.	Philadelphia,	"	Zeigler & Smith.
Riley, Charles W.	"	"	George A. Miller.
Robertson, Henry,	"	"	Frederick Brown, Jr.
Robinson, Charles H., Jr.	"	"	Jenks & Middleton.
Robinson, Joshua K.	Newark,	Delaware,	R. Newton.
Roche, Wm. F.	Philadelphia,	Pennsylvania,	E. M. Roche.
Ross, H. H.	Chester,	"	M. Marshall, M. D.
Sayre, Lucius,	Bridgeton,	New Jersey,	A. McLean.
Segner, Wm.	Palmyra,	Pennsylvania,	J. P. Fitler, M. D.
Shaw, Joseph B.		New Jersey,	J. Y. Foulke.
Shoemaker, Allen,	Philadelphia,	Pennsylvania,	R. Shoemaker & Co.
Shoemaker, Benjamin,	"	"	S. M. McCollin.
Shoemaker, Charles,	"	"	Edward Parrish.
Shoemaker, W. H.	Muncy,	"	Hassard & Co.
Shoffner, John N.	Norristown,	"	Wm. Stahler.
Shryock, Allen,	Philadelphia,	"	John Reakirt.
Simes, Samuel,	"	"	John W. Simes.
Simpson, George T.	"	"	Wm. E. Knight.
Simson, Wm. H.	Halifax,	Nova Scotia,	G. Y. Shoemaker.
Souder, Joseph A.	Philadelphia,	Pennsylvania,	Wm. R. Warner.
Spaulding, Henry M.		Ohio,	Powers & Weightman.
Stearns, Samuel T	Detroit,	Michigan,	Frederick Stearns.
Stewart, Francis,	Philadelphia,	Pennsylvania,	Powers & Weightman.
Stiefel, Louis,	"	"	Aschtenbach & Miller.
Storks, L. Scott,	Media,	"	George C. Evans.
Strehl, Louis,	Chicago,	Illinois,	W. H. Squire.
Thomas, F. W.	Dalton,	Ohio,	Paul G. Oliver.
Thompson, Wm. S. F.	Baltimore,	Maryland,	Wm. B. Thompson.
Tolsom, J. L. R.	Smyrna,	Delaware,	R. England.
Vandegrift, Isaac P.	Haddonfield,	New Jersey,	Thomas Estlack.
Vanharlingen, H. B.	West Philadelphia,	Pennsylvania,	C. Ellis, Son & Co.
Walker, Thomas A.		New Jersey.	John S. Erben.
Webb, Samuel.	Philadelphia,	Pennsylvania,	Elliot, White & Co.
Weidemann, Chas. A.	"	"	Aschtenbach & Miller.
Westermann, Jos. F.	"	"	Wm. C. Todd, M. D.
Weymer, H.	"	"	C. Ellis, Son & Co.
Wike, Albert D.	Sadsburyville,	"	Andrew Blair.
Wilson, Charles,	York,	"	Curran & Wilson.
Wilson, G. Banks,	Philadelphia,	"	Charles L. Eberle.
Wilson, William,	Parkesburg,	"	J. H. Smith.
Woodward, Charles E.	Marshalton,	"	Charles Ellis, Son & Co.